

STATE OF NEW MEXICO

MIDDLE RIO GRANDE CONSERVANCY DISTRICT

REPORT OF THE CHIEF ENGINEER

JOSEPH L. BURKHOLDER

SUBMITTING A PLAN FOR FLOOD CONTROL, DRAINAGE
AND IRRIGATION OF THE MIDDLE RIO GRANDE
CONSERVANCY PROJECT

IN THREE VOLUMES
VOLUME II

CONTRACT FORMS AND SPECIFICATIONS

THE OFFICIAL PLAN
APPROVED AUG. 15, 1928

PRICE \$1.00

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IRRIGATION OF THE MIDDLE RIO GRANDE CONSERVANCY
PROJECT

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Synopsis of the Plan

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Proposal, Exhibit B.
Agreement, Exhibit C.
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which specifications include:
(a) General conditions, Sections 0.1 to 0.56
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(c) Detail specifications, Items 1 to 99.

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(Volume III and 22 volumes of exhibits, containing 5 special reports and 290 drawings accompany this report and are a part of it, but have not been published in form available for distribution).

MIDDLE RIO GRANDE CONSERVANCY DISTRICT

Albuquerque, New Mexico

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Part III
of
The Official Plan

CONTRACT FORMS
Exhibits A, B, C and D

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CONTRACT FORMS

Exhibit A

ADVERTISEMENT

Bids for the Construction of
IRRIGATION, DRAINAGE AND FLOOD CONTROL WORKS
OFFICE OF THE BOARD OF COMMISSIONERS
MIDDLE RIO GRANDE CONSERVANCY DISTRICT

Albuquerque, New Mexico.....19.....

Sealed proposals will be received by the Middle Rio Grande
Conservancy District, Albuquerque, New Mexico, until.....
o'clock.....M....., 19....., for the construction
of

.....
involving approximately the following principal quantities:.....
.....

.....
which works are a part of the system of irrigation, drainage, flood
control and silt elimination for the Middle Rio Grande Conservancy
District, to be carried out under authority of The Conservancy Act
of New Mexico, and are in accordance with the Official Plan of the
District.

Proposals must be on the blank forms furnished by the Board,
and must be accompanied by a properly conditioned corporate surety
bond or a certified check for not less than five per cent of the aggre-
gate amount of the bid, figured on the basis of the estimated quan-
tities and the unit prices bid, but in no case need such bid bond or
check be for more than \$50,000.00. All such bonds or checks shall
be made in favor of the Middle Rio Grande Conservancy District, as
a guarantee that the bidder, if awarded a contract, will, within fifteen
days after the contract is delivered to him for that purpose, execute
the same, and furnish Surety Bond for the faithful performance of
the Contract in the sum of 55 per cent of the Contract price; said Con-
tract and Bond to be on the standard forms adopted by the Board. A
bidder submitting alternative bids may furnish a single certified check
covering the largest amount required by any alternative.

If any bidder, to whom an award has been made, shall fail to ex-
ecute the Contract or to furnish satisfactory Bond within the time
hereinbefore specified, or as extended by the Board, the award shall
thereupon become void, in which case the proceeds of the certified
check shall become the property of the District, and the Contract may

be awarded to the next lowest or best bidder; and such next lowest or best bidder shall thereupon assume the Contract, as if he were the party to whom the award was first made.

Each bidder must, in his proposal, present satisfactory evidence that he has been engaged in constructing works of the general character covered by his proposal, and that he is fully prepared, and has the necessary capital, to begin the work promptly, and to conduct it as required by the Contract and Specifications.

The right is reserved to reject any or all bids, and to waive any technical defects, as the interests of the District may require.

Drawings, Specifications, Proposal Blanks, and other information may be obtained on application to the Chief Engineer, the Middle Rio Grande Conservancy District, Albuquerque, New Mexico, at whose office drawings, boring records, and other data may be inspected. Most of this information is now on file, and the remainder will be ready for mailing on or before....., 19..... Specifications, drawings, and proposal forms covering any one Contract will be furnished for \$1.00, or for all Contracts for \$15.00.

Bids should be sealed and marked "Bid on Middle Rio Grande Conservancy Contract, No.....", and enclosed in an envelope addressed to....., Albuquerque, New Mexico, or presented in person at the time of the letting. Bids will be opened by the Board in the in Albuquerque, New Mexico, at..... M.,....., 19.....

Done this..... day of....., 19....., at Albuquerque, New Mexico, pursuant to resolution of the Board of Commissioners of the Middle Rio Grande Conservancy District.

.....
Secretary.

Exhibit B

PROPOSAL FOR CONTRACT NO.

For the Construction of, 19

To the Board of Commissioners,
Middle Rio Grande Conservancy District,
Albuquerque, New Mexico.

Pursuant to the Advertisement of your Board, published, 19, for bids for the construction described and itemized in the Schedule of Quantities and Prices contained in this proposal as designated in said Advertisement and in the specifications and contract drawings of the District, the undersigned bidder herewith proposes to do all work, perform all services, and furnish all materials (unless otherwise definitely provided in the specifications or on the contract drawings or in the schedule herein), at the unit prices named in the following schedule, within the time, at the progress rate, and in the manner required, all in accordance with the specifications for said work contained in the book entitled "Contract Forms and Specifications," issued by Middle Rio Grande Conservancy District and the drawings hereinafter designated; and agrees to execute a valid agreement and to furnish a satisfactory bond, such agreement and bond to form integral parts of the Contract consisting of advertisement, proposal, agreement, bond, specifications and drawings.

The bidder further agrees that in case of his failure to execute such agreement and furnish necessary bond, within the time fixed in the Advertisement, the check accompanying this proposal, and the money payable thereon, or on the bid bond as the case may be, shall be and remain the property of Middle Rio Grande Conservancy District, as liquidated damages for such failure.

The bidder further agrees that, in case the work is awarded to him, he will begin, prosecute and complete the work as required in the Schedule of Progress contained in this proposal; and that in prosecuting the work he will maintain the rate of progress required, as provided in Section 0.3 of the Specifications, entitled Time and Order of Completion.

The bidder shall cross out two of the three conditions following, and it is agreed that unless he does so the proposal is not subject to condition 1 or 2 below.

(1) The undersigned is bidding on more than one contract, and for the purpose of limiting his undertaking, makes this proposal sub-

ject to the condition that no other contract will be awarded him in addition to this one except:

(2) The undersigned is bidding on more than one contract, and makes this proposal subject to the condition that other contracts be awarded to him in addition to this one as follows:

(3) This proposal is not conditional upon the award of any other contract.

Note:—If the bidder wishes to bid in accordance with more than one of the above conditions, he may submit this form of proposal with suitable unit prices on each condition, in each case crossing out two of the three conditions.

LIST OF CONTRACT DRAWINGS

The Contract Drawings to be listed in Article 6 of the Agreement, as forming a part of the contract for this work are as follows:

Supplementary and Detail Drawings as may be required.

EXPERIENCE AND REFERENCES

The bidder declares that he has been engaged in the construction of works similar in character to that covered by this proposal for years, and that he has built the following works:

NATURE OF WORK, LOCALITY AND APPROXIMATE COST

And he further declares that he is fully prepared and has the necessary capital to begin the work promptly and to conduct it as required by the contract and specifications. He refers to the following persons who are competent to advise as to his financial standing and general responsibility:

Name

Address

PLANT AND EQUIPMENT

If contract is awarded under this proposal the bidder proposes to do the work on the Schedule with the following described equipment which he has and is available for immediate use on this contract:

Describe excavating machines by giving the make and type, kind (whether dragline, shovel, etc.), power (whether steam, electric or internal combustion) and horsepower rating, kind of traction (whether caterpillar, walking, trucks, etc.), weight, size of bucket, length of boom, age, condition and present location. Other machinery and plant shall be so described that its effectiveness and suitability for the work may be readily and correctly judged.

If any machinery is to be acquired, so state, describe, and give date.

Failure to specify the plant and equipment to be used for doing the work will be sufficient cause for rejecting the bid.

The undersigned bidder declares that the only persons or parties interested in this proposal as principals are named herein; that this proposal is made without collusion with any other person, firm or corporation; that he or his agent has carefully examined the location of the proposed work, the proposed form of contract, specifications and the drawings for said contract, and is informed as to local conditions affecting the proposed work.

This proposal is conditioned on the award being made, and the work being financed and ready to proceed, on or before....., 19, unless by agreement this proposal is held binding for a longer period.

Bidder's Signature:	Address:
..... (SEAL)	
..... (SEAL)	
..... (SEAL)	

Exhibit C

AGREEMENT

This Agreement made and entered into this.....day of
....., in the year of our Lord one thousand
nine hundred and....., by and between the
Middle Rio Grande Conservancy District, a corporation organized and
existing under The Conservancy Act of New Mexico, acting through
its Board of Commissioners, by virtue of the power vested in it by
said Act, party of the first part, and.....

.....
of the City of....., County of.....
and State of....., (hereinafter designated as
the Contractor), party of the second part,

Witnesseth: That the parties to these presents each in the con-
sideration of the undertakings, promises and agreements on the part
of the other herein contained, have undertaken, promised and agreed,
and do hereby undertake, promise and agree, the party of the first
part for itself, its successors and assigns, and the party of the
second part, for.....and.....
heirs, executors, administrators, successors and assigns, as follows:

Article 1. In consideration of the payments to be made as here-
inafter provided, and of the performance by the party of the first
part of all the matters and things by it to be performed as herein
provided, the Contractor, party of the second part, agrees, at his own
sole cost and expense, to perform all the labor and services, and fur-
nish all the materials, plant, and equipment necessary to complete, and
to complete in good, substantial, workmanlike, and approved manner,
within the time hereinafter specified, and in accordance with the
terms, conditions and provisions of the Contract and of the instruc-
tions, orders and directions of the Engineer made in accordance with
the Contract, the following work, to-wit:

.....
.....
.....
Article 2. The Contractor further agrees to begin work within
..... days from the date of execution hereof, and to
prosecute the same with speed and diligence so as to insure the com-
pletion of the work on or before.....

.....
It is hereby agreed that the period from the date of the execution of

this Agreement to
 hereafter called the End of Period of Preparation, shall be utilized by the Contractor in assembling plant and equipment, organizing forces, and in getting the work under way so that thereafter he may maintain the rate of progress prescribed, and complete the work within the time specified in the Contract.

The maintenance of the required rate of progress on the Contract, and its completion within the specified time, being to an exceptional degree necessary for the complete success of the work, the Contractor agrees to take all precautions in preparation and management which may be necessary to insure the rate of progress and the time of completion required by the Contract.

Article 3. The Middle Rio Grande Conservancy District, party of the first part, agrees to pay, and the Contractor, party of the second part, agrees to accept as full compensation, satisfaction and discharge, for all work done and all materials furnished, whether mentioned in the following schedule or not, and for all costs and expenses incurred and damages sustained, and for each and every matter, thing or act performed, furnished or suffered in the full and complete performance and completion of the work of the Contract in accordance with the terms, conditions, and provisions thereof and of the instructions, orders, and directions of the Engineer thereunder, except Extra Work which shall be paid for as provided in Section 0.19 of the Specifications, and except as in the Contract otherwise specifically provided, a sum equal to the amount of the actual work done and materials furnished, as determined by the Engineer, under each Item in the following schedule multiplied by the Unit Price applicable to each such Item, as set forth in the following Schedule, to-wit:

SCHEDULE OF UNIT PRICES AND ESTIMATED QUANTITIES

Contract No.

Item	Description	Estimated Quantity	Unit of Quantity	Unit Price
------	-------------	--------------------	------------------	------------

Article 4. In case of default in completing the whole work to be done under the Contract within the time herein specified, including such extensions as may have been granted, the Contractor hereby agrees to pay to the party of the first part as liquidated damages, in lieu of a fixed amount per day for such delay: First, a sum sufficient to compensate said first party for the cost and expense of employing engineers, inspectors, and employees to the extent that their services are reasonably required during the period of default by the work of the Contract; and second, a sum equal to one-half of one per cent on all moneys that have been paid the Contractor under the Con-

tract for each calendar month or part thereof that the completion of the whole work under the Contract is delayed. The party of the first part shall have the right to deduct such liquidated damages from any moneys due or to become due the Contractor, and the amount, if any, still owing after such deduction shall be paid on demand by the Contractor or his Surety. Payment of such liquidated damages shall not relieve the Contractor or his Sureties from any other obligation under the Contract, but shall be additional thereto.

Article 5. If the Contractor shall fail to comply with any of the terms, conditions, provisions, or stipulations of the Contract according to the true intent and meaning thereof, then the party of the first part may avail itself of any or all remedies provided in that behalf in the Contract, and shall have the right to proceed in accordance with the provisions thereof.

Article 6. It is hereby agreed by the parties to this Agreement that the following exhibits attached thereto and made parts thereof shall constitute integral parts of said Agreement, the whole to be collectively known and referred to as the **Contract**:

- | | |
|------------------------------|-----------|
| 1. Advertisement | Exhibit A |
| 2. Proposal (Certified copy) | Exhibit B |
| 3. Agreement | Exhibit C |
| 4. Bond | Exhibit D |
| 5. Specifications | Exhibit E |

which specifications include:

- (a) General conditions.
- (b) General specifications.
- (c) Detail specifications.

- | | |
|----------------------|-----------|
| 6. Contract Drawings | Exhibit F |
|----------------------|-----------|
- listed as follows:

CONTRACT DRAWINGS FOR CONTRACT NO.

No.	TITLE
-----	-------

Article 7. The Contractor agrees to furnish a bond or bonds in such form and in such amount and with such Sureties, as is hereinafter provided, and as will be satisfactory to the Board of Commissioners, conditioned upon the faithful and complete performance and carrying out of the Contract.

In Witness Whereof, the Middle Rio Grande Conservancy District, party of the first part, its Board of Commissioners having duly approved and authorized this Agreement by resolution passed on the _____ day of _____, 19____, has hereunto af-

fixed its corporate name and the name of its President, and has here-
to attached its corporate seal attested by its Secretary, and.....

.....
.....
party of the second part, has hereunto affixed his their name.....
and seal..... its corporate name by its.....
thereunto duly authorized. and has hereto attached its corporate seal
attested by its Secretary, in duplicate, the day and year first above
written.

MIDDLE RIO GRANDE CONSERVANCY DISTRICT,
By.....
President,
(Seal) PARTY OF THE FIRST PART.
Approved:

.....
Chief Engineer.

Attest:

.....
Secretary.

By.....
President.

(Seal) (SEAL)
..... (SEAL)
PARTY OF THE SECOND PART.

Attest:

.....
Secretary.

.....
Witnesses.

Exhibit D

BOND

That we, _____, as principal and _____, a corporate surety company duly authorized to do business and act as surety on bonds in the State of New Mexico, are held and firmly bound unto the Middle Rio Grande Conservancy District, a corporation organized and existing under The Conservancy Act of New Mexico, (hereinafter called the District) in the penal sum of _____ Dollars, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Witness our hand and seal this _____ day of _____, A. D. 19_____.

The Condition of the above obligation is such that whereas, the above bounden _____ (hereinafter called the Contractor) on the _____ day of _____, 19_____, at a regular meeting of the Board of Commissioners of the Middle Rio Grande Conservancy District did obtain and was awarded a contract for _____

_____ and has entered into a Contract for the construction thereof, in accordance with the provisions of said Contract, a copy of which is hereto attached and made a part hereof.

Now, Therefore, if the said _____ shall satisfy all claims against the District for injury to life, limb or property that may be caused by the acts of, or negligence of, the Contractor or any of his sub-contractors, agents or employees; and shall satisfy all suits or claims brought against the District arising from the violation on the part of the Contractor, or any of his sub-contractors, agents or employees, of any law, ordinance, regulation, order or decree; and shall satisfy all such suits or claims arising from any infringement, or alleged infringement, of patents in the work under said Contract; and shall satisfy, and save the District harmless from any claims or damages that may accrue by reason of any failure to carry out the provisions of said Contract, or howsoever originating from any of the operations under said Contract; and shall save the District harmless from any and all claims of material men, sub-contractors, or any other claim in connection with said work, in any event; and shall in all other particulars faithfully keep and perform the Contract on his part according to all the terms, conditions and covenants thereof, and within the specified time; and shall indemnify and save harmless the District from all cost and damage which it may suffer by reason

of failure so to do, and fully reimburse and repay the District all outlay and expense which the District may incur in making good any such default; and in addition to all other conditions, if (in case the Contractor or his or its sub-contractor or sub-contractors fail to duly pay for any labor, material, team hire, sustenance, provisions, provender, or other supplies used or consumed by such Contractor or his or its sub-contractor in the performance of the work contracted to be done), the surety shall pay the same in an amount not to exceed the sum specified in this bond, together with interest at the rate of eight per cent per annum; then this obligation to be void and otherwise to remain in full force and effect.

Provided:

First. That should the Contractor fail to comply with the provisions of the Contract to such an extent that the Contract shall be forfeited, the surety shall have the right to assume the Contract and proceed to perform or sublet the same, as therein provided, and the surety shall in that event be subrogated to all the rights and interests of the Contractor arising out of the Contract, and be entitled to hold and use all of the equipment and properties of the Contractor which may be necessary for the completion of the Contract; and all moneys which may be due the Contractor at the time of his default or which may thereafter become due said Contractor under and by virtue of said Contract, shall become due and payable to the surety as the work progresses, subject to all of the terms of the Contract.

Second. That any alteration which may be made in the terms of the Contract or in the work or materials to be furnished thereunder; or the granting by the District of any extension of time; or any forbearance or action on the part of either the District or the Contractor toward the other under said Contract; shall not in any way release the Contractor and the surety or either of them, their heirs, executors, administrators, successors, or assigns from their liability hereunder; notice to the surety of any such alteration, extension, forbearance, or action being hereby waived; provided that the written consent of the surety shall first be obtained if any alteration be required which shall alter the general character of the work as a whole, or which shall increase the total amount to be paid the Contractor by more than twenty-five per cent.

Signed and sealed this.....day of.....,
19....., at Albuquerque, New Mexico.

.....(SEAL)

.....(SEAL)

.....(SEAL)

PRINCIPAL.

.....(SEAL)

SURETY.

ACKNOWLEDGMENT

STATE OF NEW MEXICO }
County of..... } ss.

On this.....day of....., 19....., before
me personally appeared....., who, being
by me duly sworn did say that he is the.....,
of the....., a corporate surety company duly
authorized to do business and act as surety on bonds in the State of
New Mexico, and that the seal affixed to said instrument is the
corporate seal of said corporation and that said instrument was signed
and sealed on behalf of said corporation by authority of its Board of
Commissioners, and said....., acknowledged said
instrument to be the free act and deed of said corporation.

.....
Notary Public

My commission expires:

Part III
of
The Official Plan

SPECIFICATIONS
Exhibit E

Part III
of
The Official Plan

SPECIFICATIONS
Exhibit E

SPECIFICATIONS

Exhibit E

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SPECIFICATIONS

Exhibit E

EXPLANATORY NOTE

An explanation and few suggestions concerning use of the Specifications and item numbers are given to assure full benefit from their use.

The Specifications fall into three parts: First, the General Conditions, Sections 0.1 to 0.55; Second, the General Specifications, Sections 0.58 to 0.133, defining and classifying the most commonly used materials, and indicating in general how the work shall be done and how payment shall be made; and Third, the Detail Specifications, Items 1 to 99. The Detail Specifications, by supplementing the General Conditions, the General Specifications, and the Drawings, define in detail the class and quality of material to be furnished for each kind of work, and specify how each kind of work shall be done and how the material and work shall be measured for payment.

The different kinds of construction work to be done and of material to be furnished are classified into items, each item covering a certain kind of work to be done, or material to be furnished, in a certain definite manner, regardless of its location. Each item is designated by name and number, the numbers running from 1 to 99: as Item 2, Clearing; or Item 45, Steel Reinforcement, Furnishing. All sections relating to any item bear the number of the item as an index number before the decimal point. For instance, Item 30 covers Embankment for Levees. Section 30.1 describes the class of construction required; Sections 30.2, 30.3, 30.4 and 30.5 cover, respectively, Borrow Pits, Materials and Workmanship, Preparation of Foundation and Structures, while Section 30.6 designates how payment shall be made.

All item numbers with letter "a" affixed refer to work below mean low water level. For instance, Items 39 and 39a cover plain concrete structures, above and below mean low water, or below a fixed elevation, respectively. The same item may be met on various parts of the project. Wherever in the estimates or on the drawings Item 39 is indicated, whether it is used in connection with spillways, or bridge piers, or other construction, the work to be done is that of placing concrete above mean low water level in accordance with the Specifications under Item 39, supplemented in all cases by the General Specifications, which apply to all items, and by special provisions which may be indicated on the Drawings or in the Agreement. Item 39a covers the same kind of construction as Item 39, except that the work is located below mean low water level.

In brief, the General Conditions and General Specifications relate, in so far as they are applicable, to all work. The Schedule of Unit

Prices and Estimated Quantities in the Agreement, and the Contract Drawings indicate under what item any particular part of the work is to be done, and the Detail Specifications for that item give the necessary directions for doing that particular work.

The Agreement and Contract Drawings may include additional provisions and further directions, or show modifications or exceptions to the Specifications. The contract and working drawings may be marked with item numbers as a reference to the Specifications and Estimates, and notes may be added in cases where the Specifications need amplification or modification. Special provisions not suitably arranged in the Specifications, nor subject to notes of modification on the Drawings, may be written into the Agreement.

The project may be divided into parts or groups each of which would make a suitable unit to be kept separate as a construction feature to be handled by one branch of the construction organization either by force account or by contract. The item numbers are useful for cross reference purposes on the drawings, in the estimates, in schedules of work to be done, progress estimates, and accounting. For instance, 3-40, no matter where found, would always refer to reinforced concrete on Feature 3, or 16-40 would always refer to reinforced concrete on Feature 16, exclusive of cement and reinforcing steel.

The paragraph covering "Payment" defines definitely what is included in each item comprising an estimate, and in order to be certain that estimates, bids and contracts will cover the work without omissions, the payment paragraph of each item may be examined to determine exactly what is included. The responsibility for small portions of work is, therefore, readily fixed and omissions prevented, such as might occur between a furnishing and an erection item in the nature of unloading from cars and hauling to the site, or the cost of temporary storage of material.

A cost estimate schedule prepared according to the Items may be used with little or no modification in the bid form, and in the Schedule of Work contained in the Agreement in case of contracts, and as a guide in an accounting system. It would form the basis for readily and accurately comparing the estimates with bids, contracts, and the final costs.

GENERAL CONDITIONS

0.1 Definitions.—Wherever the words herein defined, or pronouns used in their stead, occur in the Specifications and other instruments, which, collectively, form the Contract, they shall have the meanings here given:

The word **District** shall mean the body corporate Middle Rio Grande Conservancy District, a political subdivision of the State of New Mexico.

The word **Board** shall mean the Board of Commissioners of the Middle Rio Grande Conservancy District, or any agency or officer duly authorized to act for the District in the execution of the work required by the Contract.

The word **Commissioners** shall mean the individual members of the Board of Commissioners in their official capacity.

The word **Engineer** shall mean the Chief Engineer of the Middle Rio Grande Conservancy District, acting through his properly authorized agents, engineers, assistants, inspectors, and superintendents, acting severally within the scope of the particular duties entrusted to them.

The word **Contractor** shall mean the person, persons, partnership, or corporation entering into a Contract for the performance of the work required by it, and the legal representatives of said party, or the agent appointed to act for said party in the performance of the work.

The words **Surety** or **Sureties** shall mean the bondsmen or party or parties who have made secure the fulfillment of the Contract by a Bond, and whose signatures are attached to said Bond.

The word **Contract** shall mean, collectively, all of the covenants, terms, and stipulations contained in the various portions of the Contract, to-wit:

Advertisement, Agreement, Bond, Specifications, and Contract Drawings.

The word **Specifications** shall mean, collectively, all of the terms and stipulations contained in those portions of the Contract known as the General Conditions, General Specifications, and Detail Specifications.

The word **Drawings** shall mean, collectively, all of the drawings attached to the Contract and made part thereof, and also such supplementary drawings as the Engineer may issue from time to time in order to elucidate said contract drawings or for showing details which are not shown thereon, or for the purpose of showing changes in the work as authorized under Section 0.18 of the Specifications entitled **Changes and Alterations**.

The words **Contract Price** shall mean either the unit price or unit prices named in the Agreement, or the total of all payments under the Contract at the unit price or unit prices, as the case may be.

Wherever in the Contract the words **Directed, Required, Permitted, Ordered, Instructed, Designated, Considered Necessary, Prescribed**, or words of like import are used, it shall be understood that the direction, requirement, permission, order, instruction, designation, or prescription, etc., of the Engineer is intended; and similarly, the words **Approved, Acceptable, Satisfactory**, or words of like import, shall

mean approved by, or acceptable or satisfactory to, the Engineer, unless another meaning is plainly intended.

Wherever figures are given in the Contract after the word **Elevation** or an abbreviation of it, or where figures representing elevations are given, they shall be taken as referring to the Official Elevation Datum of the U. S. Coast and Geodetic Survey, such elevations being determined from a bench mark in Albuquerque at the Alvarado Hotel in cement, described as follows: A cross in the top of an iron post inscribed "U. S. Coast and Geodetic Survey, adjusted value 1912."

The Official Elevation of the above described bench mark is 4953.202.

0.2 Sureties.—With the execution and delivery of the Contract the Contractor shall give security for the faithful performance of the Contract by filing with the Board one or more Surety bonds in the form annexed hereto, the aggregate amount of which shall be not less than fifty-five (55) per cent of the estimated total contract price. Each bond must be signed by the Contractor and the Sureties. The Sureties, and the amount in which each will qualify, must be satisfactory to the Board.

Should any Surety upon the Contract be deemed unsatisfactory at any time by the Board, notice will be given the Contractor to that effect, and the Contractor shall forthwith substitute a new Surety or Sureties satisfactory to the Board. And no further payment shall be deemed due or shall be made under this Contract, until the new Surety or Sureties shall qualify and be accepted by the Board.

0.3 Time and Order of Completion.—The Contractor agrees that the work shall be commenced and carried on at such points, and in such order of precedence, and at such times and seasons as may be directed by the Engineer, in accordance with Section 0.10 of the Specifications. The Engineer shall have the right to have the work discontinued in whole or in part for such time as may be necessary, should the condition of the weather, or of flood, or other contingency make it desirable so to do, in order that the work shall be well and properly executed. Extension of time may be granted the Contractor for discontinuance of work so required, as provided in Section 0.4 of the Specifications, entitled Extension of Time.

The Contractor further agrees that he will begin work not later than at the time specified in the Agreement, and will progress therewith at such a rate that the work shall be completed in accordance with the Contract. It is further agreed that the rate of progress shall be at least such that the work accomplished up to the end of each period representing a one-fourth of the time allowed for completing of the Contract,—excluding the specified period of preparation,—shall have the same proportion to the whole work, as the time consumed

since the end of the period of preparation has to the entire time allowed for completing the Contract after the period of preparation.

Determination as to whether this rate of progress is being maintained shall be made by comparing the value, at the contract price, of the work done as shown in the progress estimates, with the total estimated contract price. Any failure to maintain the required rate of progress, after taking into consideration extensions of time that have been granted, shall be a breach of contract, in the same manner as failure to complete the entire work within the specified time.

The Board shall have the right, at its discretion, to extend the time for the completion of the work beyond the time stated in the Contract, for reasons set forth in Section 0.4, entitled Extension of Time, but such extension, if so granted, shall waive no other obligations of the Contractor or of the Sureties, and if the time for the completion of the work be extended by the Board, then in such case, the District shall be fully authorized and empowered to make such deductions from the final estimate of the amount due the Contractor, as are stipulated in Article 4 of the Agreement, for each calendar day that the Contractor shall be in default for the completion of the work beyond the date to which the time of completion shall have been extended by the Board. Should the Contractor be permitted to continue and finish the work or any part thereof after the time fixed by the Contract for completion, or as it may have been extended, such permit shall in nowise operate as a waiver on the part of the District, of its right to collect the liquidated damages agreed upon in case of such delay, or of any of its rights under the Contract.

0.4 Extension of Time.—Delays due to causes beyond the control of the Contractor other than such as reasonably would be expected to occur in connection with or during the performance of the work, may entitle the Contractor to an extension of time for completing the work sufficient to compensate for such delay. No extension of time shall be granted, however, unless the Contractor shall immediately, but in any case within 15 days from the initiation of the delay, notify the Engineer in writing of such delay, and of the time of beginning and the cause of the same, and unless he shall within 15 days after the expiration of such delay notify the Engineer in writing of the extension of time claimed on account thereof,—and then only to the extent, if any, allowed by the Engineer. To allow or to require completion of the work after the time specified shall not constitute an extension of time. No extension of time shall operate to release the Surety from any of its obligations.

The Contractor declares that he has familiarized himself with weather, river, and local conditions and other circumstances which may, or are reasonably likely to, affect the performance and completion of the work, and agrees that, taking these conditions and circum-

stances into account, he will provide adequate equipment and prosecute the work in such manner, and with such diligence, that the same will be completed within the time specified, even though the most adverse conditions which reasonably could be expected to occur during the period of construction do prevail during the performance of the work. It is understood, however, that as to river and weather conditions the Contractor shall provide against the most adverse conditions and circumstances which reasonably are to be expected to occur on the average within a 15-year period, as shown by past records.

Should the work of the District be enjoined or delayed by legal proceedings which prevent the Contractor from prosecuting any of the work of the Contract, an extension of time may be granted sufficient, in the opinion of the Engineer, to compensate for such delay. But no delay by legal proceedings as to a part of the Contractor's work shall entitle him to an extension of time, unless, in the opinion of the Engineer, such legal proceedings unavoidably delay the completion of the whole Contract.

0.5 District to Furnish Right-of-Way.—The District will furnish to the Contractor all right-of-way, which, in the opinion of the Engineer, is necessary for carrying on the work, for taking or wasting material, and for securing access to the site of the work. In case of serious interference with the work by delay in furnishing such right-of-way, the Contractor shall be allowed an extension of time, under the provisions of Section 0.4, entitled Extension of Time, equivalent to the time lost by unavoidable delay in the completion of the Contract because of the failure to furnish the right-of-way on time.

In case of serious delay and loss to the Contractor because of failure of the District to furnish right-of-way which in the opinion of the Engineer is necessary for the work, the Contractor shall be compensated for such loss.

0.6 Inspection and Right of Access.—The District contemplates, and the Contractor hereby agrees to, a thorough and minute inspection by the Engineer, or by any of his agents or by any agents which the Board may appoint for such purpose, or by the State Engineer if required by law, of all work and material furnished under the Contract, in order to ascertain whether all workmanship or materials are in strict accordance with the requirements of the Contract. The Contractor is entitled to such inspection, at such times and places as inspection can reasonably be made, upon application to the Board or to the Engineer, provided that when the Contractor requests the inspection of materials not yet delivered to the site of the work, he shall pay the reasonable traveling expenses of the Engineer or agent in making such inspection, and he shall not require the continued presence of the Engineer or agent at the place of manufacture or shipment for the purpose of making intermittent or occasional inspections.

The Contractor shall furnish to the Board, the Engineer, or any of their agents, access at all times to the work and to the premises used by the Contractor, and shall provide them every reasonable assistance and facility, including ladders, steps, scaffolds, or platforms, as may be desirable, for the purpose of inspection, even to the extent of discontinuing portions of the work temporarily, or of uncovering or taking down portions of finished work. In case of taking down or uncovering work, should the work thus exposed or examined prove satisfactory, the uncovering or taking down, and replacing or making good, of the parts disturbed, shall be paid for as Extra Work as provided in Section 0.19 of the Specifications, entitled Extra Work; but should the work examined prove unsatisfactory, the uncovering, taking down, replacing and making good shall be at the expense of the Contractor. The Contractor shall make no charge for the assistance given or for temporary discontinuance of the work for purposes of inspection.

The Contractor agrees to make suitable provision for the unrestricted inspection by any authorized engineer or agent at places of manufacture, of any materials being made or prepared for use under the Contract.

The Contractor shall regard and obey the directions and instructions of any authorized engineer or agent with reference to correcting any defective work or replacing any materials found to be not in accordance with the Specifications and Drawings, and in case of dispute the Contractor may appeal to the Chief Engineer, whose decision shall be final; but pending such decision the instructions of said engineer or agent shall be followed, and the Contractor shall make no claim for damages or delay on this account, except as provided in Section 0.39, of the Specifications, entitled Hindrances and Delays.

The Contractor shall, whenever so requested, give the Engineer access to the proper invoices, bills of lading, and other records.

0.7 To Remedy Defective Work.—If the work, or any portion thereof, shall be damaged in any way, or if defects not readily detected by inspection shall develop before the final completion and acceptance of the whole work, the Contractor shall forthwith make good without compensation such damage or defect, in a manner satisfactory to the Engineer. Any materials brought upon the ground for use in the work, which shall be condemned by the Engineer as unsuitable, or not in conformity with the Contract, shall be immediately discarded and removed by the Contractor to a satisfactory distance from the work.

If the Contractor shall fail to replace any defective or damaged work or material after reasonable notice, the Engineer may cause such work or materials to be replaced, and the expense thereof shall be borne by the Contractor.

o.8 Retaining Imperfect Work.—If the Contractor shall execute any part of the work defectively, and if the imperfection in the opinion of the Engineer shall not be of such magnitude or importance as to necessitate the removal and reconstruction of the imperfect part, or be of such nature as to make such procedure impracticable or dangerous or undesirable, then the Engineer shall, with the written approval of the Board, have the right to make such deduction from the amounts due or to become due the Contractor as may be just and reasonable instead of requiring the imperfect part to be removed and reconstructed.

o.9 Engineer Cannot Waive Obligations.—It is expressly agreed that neither the Engineer, nor any of his assistants or agents shall have any power to waive the obligations of the Contract with respect to the work to be done or the manner of doing it. Failure or omission on the part of the Engineer, or any of his assistants or agents, to condemn defective or inferior work or material shall not imply acceptance of the work, or release of the Contractor from obligation to at once tear out, remove and properly replace the same without compensation, and at his own cost and expense, at any time upon the discovery of said defective work and material, prior to the final acceptance of the entire Contract and the release of the Contractor by the Board, notwithstanding that such work or such material may have been estimated for payment, or payments may have been made on the same. Neither shall such failure or omission, nor any acceptance by the Engineer or by the Board, be construed as barring the Board, at any subsequent time, from recovery of damages, and of such a sum of money as may be needed to remove and to build anew all portions of the work in which fraud was practiced or improper work or material hidden.

o.10 To Direct Work.—It is mutually agreed that the Engineer shall have the right to direct the manner in which all work under the Contract is to be conducted, in so far as may be necessary to secure the safe and proper progress and quality of the work.

Upon all questions concerning the execution of the work, and the interpretation of the Drawings and Specifications, and on the determination of quantities and cost, the decision of the Engineer shall be final and binding on both parties, and his estimates and decisions shall be a condition precedent to the right of the Contractor to receive any money under the Contract.

Whenever, in his opinion it is necessary, in order to insure the safe and proper completion of the Contract, he shall determine the order of precedence, and the time and seasons at which any portion or portions of the work shall be commenced and carried on.

He shall especially direct the manner of conducting the work when it is in locations where the District is doing other work either

by contract, or by its own force, or where it is necessary to have constructed or reconstructed railroads, traction lines, telephone or telegraph lines, highways or other works affected by the improvement, in order that conflict may be avoided and the work on this Contract be harmonized with that on other contracts or with other work being done in connection with, or growing out of any operations of the District.

o.11 To Provide for Emergencies.—It is understood by all parties to the Contract that unusual conditions may arise on the work which will require that immediate and unusual provisions be made to protect the public from danger of loss or damage due directly or indirectly to the prosecution of the work, and that it is part of the service required of the Contractor to make such provisions.

The Contractor shall use such foresight and shall take such steps and precautions as may be necessary to protect the public from danger of damage or loss of life or property, which would result from the interruption of public water supply or other public service, or from the failure of partly completed work.

Whenever, in the opinion of the Engineer, an emergency exists, against which the Contractor has not taken sufficient precaution for the safety of the public or the protection of the works to be constructed under the Contract, or of adjacent structures or property which may be injured by processes of construction on account of such neglect; and whenever, in the opinion of said Engineer, immediate action shall be considered necessary in order to protect public or private, personal or property interests liable to loss or damage on account of the operations under the Contract, then, and in that event, the Engineer, upon giving notice to the Contractor, may provide suitable protection to said interests by causing such work to be done and material to be furnished as, in the opinion of the Engineer, may seem reasonable and necessary.

The cost and expense of said work and material shall be borne by the Contractor, and if he shall not pay said cost and expense upon presentation of the bills therefor duly certified by the Engineer, then said cost and expense shall be deducted from any amounts due or which may become due said Contractor. In case the Board shall decide that all or part of the expense incurred in meeting any emergency is such as for any reason cannot be justly charged to the Contractor, it may compensate the Contractor for all or part of the work done and material furnished in meeting such emergency.

o.12 To Modify Methods and Equipment.—Except where otherwise directly specified in the Contract, the Contractor shall design, lay out, and be responsible for the methods and equipment used in fulfilling the Contract; but such methods and equipment, when required, shall have the approval of the Engineer. Whenever required, the

Contractor shall furnish to the Engineer for his information, bills of materials, descriptions and copies of drawings showing in reasonable detail the materials and construction of any construction plants, false work, structures, parts of any structures, or appliances, to be furnished or built under the Contract, for which complete detail drawings are not to be issued by the Engineer. If at any time the Contractor's methods or equipment appear to the Engineer to be unsafe, inefficient, or inadequate for securing the safety of the workmen, the quality of work, or the rate of progress required, he may order the Contractor to increase their safety and efficiency, or to improve their character, and the Contractor shall comply with such orders. If at any time the Contractor's working force, in the opinion of the Engineer, shall be inadequate for securing the necessary progress, as herein stipulated, the Contractor shall, if so directed, increase the force or equipment to such an extent as to give reasonable assurance of compliance with the schedule of progress; but the failure of the Engineer to make such demand shall not relieve the Contractor of his obligation to secure the quality, the safe conducting of the work, and the rate of progress required by the Contract; and the Contractor alone shall be responsible for the safety, efficiency and adequacy of his plant, appliances and methods.

0.13 To Furnish Lines and Grades.—All lines and grades will be given by the Engineer, but the Contractor shall provide such materials as are not normally part of an engineering equipment, and give such assistance as reasonably may be required by the Engineer in order that measurements may be made. He shall not be required, except for brief intervals, to furnish men or material to do the work which would naturally belong to members of a surveying party. It is the intention not to delay the work for the giving of lines or grades, but if necessary working operations shall be suspended for such reasonable time as the Engineer may require for this purpose. No special compensation shall be made for the cost to the Contractor, of any of the work or delay occasioned by giving lines and grades, or by making other necessary measurements; but such costs, it is agreed, shall be included in the Unit Prices stipulated for the appropriate items of construction. The Contractor shall keep the Engineer informed a reasonable time in advance, of the times and places at which he intends to do work, in order that lines and grades may be furnished and necessary measurements for record and payment may be made with the minimum of inconvenience to the Engineer or of delay to the Contractor.

All marks and stakes must be carefully preserved by the Contractor, and in case of their destruction by him, or any of his employees, such stakes will be replaced by the Engineer at the Contractor's expense.

0.14 To Determine Quantities and Measurements.—The Engi-

neer shall make all measurements, and determine all quantities and amounts of work and materials done or furnished under the Contract.

Unless specifically so stated in detail in the Contract or Specifications, no extra measurements, or measurements according to local custom of any kind, shall be allowed in measuring the work under this Contract; but only the length, area, solid contents, number, weight, or time, in standard units, as the case may be, shall be considered.

It is stipulated and agreed that the planimeter shall be considered an instrument of precision adapted to the measurement of areas.

0.15 To Define Terms and Explain Plans.—The various parts of the Contract are intended to be explanatory of each other, but should any discrepancy appear, or any misunderstanding arise, as to the work to be done in the performance of the Contract, or the time or manner thereof, or the amount due the Contractor, the decision of the Engineer shall be final and binding on all parties and sureties. Correction of any error or omission in the Drawings and Specifications may be made by the Engineer, when such correction is necessary to bring out clearly the intention of which is indicated by a reasonable interpretation of the Drawings and Specifications as a whole.

Whenever, in the Specifications, or in Drawings which are a part of the Contract or which may be furnished to the Contractor for directing his work, the terms or descriptions of various qualities of workmanship, material, structures, processes, plant, or other features of the Contract, are described in general terms, the meaning and fulfillment of which must depend upon individual judgment; then, in all such cases, the question of the fulfillment of such Specifications or requirements shall be decided by the Chief Engineer, and said material shall be furnished, said work shall be done, and said structure, process, plant, or feature shall be constructed, furnished or carried on in full and complete accordance with his interpretation of the same, and to his full satisfaction and approval.

0.16 Completeness of Specifications, Estimates, and Drawings.—The Specifications and Drawings, taken in connection with the estimates and other provisions of the Contract, are intended to describe and show the work required to be done, and the material required to be furnished. The quantities of the various classes of work to be done and materials to be furnished under the Contract, are presented for the purpose of comparing on a uniform basis the proposals offered for the work under the Contract. It is recognized to be impracticable to determine beforehand with accuracy the quantity entering into the construction.

The Specifications and Drawings are to be taken, therefore, as indicating the approximate amount of work, its approximate nature and position, and the method of construction, insofar as the same are

determined in advance, and neither the Board nor any agent or officer thereof guarantees that the actual amount of work will correspond with the quantities estimated by the Engineer; and the Contractor hereby agrees that he will make no claim for anticipated profits, or for losses, because of any difference between the quantities of the various classes of work actually done, or materials actually furnished, and the estimated quantities stated in the Agreement. The work is intended to be constructed in accordance with the best practice and with due regard for the safety of the structures; and in the event of any doubt as to the meaning of any portion of the Contract, Specifications, Drawings, Supplementary Drawings, or instructions of the Engineer, the same shall be understood to call for the best types of construction, both as to materials and workmanship, which reasonably can be interpreted.

Wherever, in the Specifications or in the Drawings, standard specifications or other publications are referred to, copies thereof may be found, available for reference, at the office of the Chief Engineer.

Any work or material not herein specified or shown on the Drawings, but which by fair implication would be included in any items in the Contract, shall be done or furnished by the Contractor without additional charge therefor.

0.17 Items of Work.—The division into Items has been made to enable the Contractor to bid on the different portions of the work in accordance with his estimate of their unit cost, so that in the event of any increase or decrease in the quantities of any particular kind of work, the actual quantities executed may be paid for at the Unit Price for that particular kind of work.

0.18 Changes and Alterations.—The Board reserves the right to make such alterations, eliminations, and additions as it may elect in the line, grade, form, location, dimensions, plan or material of the work herein contemplated, or any part thereof, either before or after the commencement of construction.

If such changes diminish the quantity of work to be done, they shall not constitute a claim for damages or anticipated profits, but a reasonable allowance shall be made to the Contractor for actual expense incurred in installing plant in anticipation of the work dispensed with, or for materials made useless thereby, providing he makes claim therefor within 30 days from notice of the change or elimination. If such allowance cannot be agreed upon by the Engineer and the Contractor, they shall submit the matter to a referee, mutually agreed upon, whose determination shall be final and binding on both parties.

If work already done shall be rendered useless, or if the amount of work shall be increased, as a result of such changes or alterations,

such work rendered useless or such increased work shall be paid for at the Unit Prices stipulated in the Contract.

o.19 Extra Work.—If, during the performance of the Contract, it shall become necessary or desirable for the proper completion of the work hereunder to order additional work done or materials furnished, whether mentioned herein or indicated on the Drawings or not, which in the opinion of the Engineer cannot be classified under the schedule of Unit Prices stipulated in the Contract involved, the Contractor shall, if ordered in writing by the Engineer, and not otherwise, do and perform such work and furnish such materials; and he shall be paid therefor the actual and necessary net cost, as determined by the Engineer, plus 15 per cent thereof. Such actual net cost shall cover all labor and materials and supplies necessary for the performance of the extra work, including any extraordinary expenses incurred directly on account thereof, the wages of foremen, reasonable rental upon plant, as determined by the Engineer, for its use, depreciation, wear and tear, and limited to the pieces and the time actually and necessarily used—exclusive of breakdowns and repair time, and the expense attached to Contractor's compensation and liability insurance covering the labor so employed; but in making payment to the Contractor for such extra work, no allowance shall be made for overhead charges, general superintendence, general expenses, contingencies, or surety bonds. Charge for extra work shall not include the maintenance of the Contractor's camp, except in case such camp be maintained primarily to carry on extra work.

The Contractor shall have no further claim in excess of the foregoing, and this method of payment shall not apply to the performance of any work or the furnishing of any material which, in the opinion of the Engineer, can be classified under the schedule of unit prices. In case any work or material shall be required to be done or furnished under the provisions of this section, the Contractor shall at the end of each day during the progress thereof furnish to the Engineer daily time slips showing the name or number of each workman employed thereon, with the time worked, the character of work he is doing and the wages paid or to be paid to him. If required by the Engineer, the Contractor shall produce any books, vouchers, records, and memoranda showing the work and materials actually paid for and the actual prices therefor. Such daily time slips and memoranda shall not be binding upon the District, except in so far as they are reasonable, accurate, and pertinent, and if any question or dispute should arise as to the correct cost of such extra work or material, the Engineer and the Contractor shall agree upon a referee, whose decision upon such question shall be final and conclusive.

It is further agreed that if at any time the number of men employed by the Contractor on work done under this section of the Con-

tract, or the character of such men or the plant and equipment so employed, are not, in the opinion of the Engineer, the best adapted for the satisfactory prosecution of the work, the Engineer shall so notify the Contractor in writing, whereupon the latter shall increase or decrease the number of men, or substitute different men, or make such changes in plant and equipment, as shall be ordered by the Engineer. Extra Work so ordered shall constitute a part of the work to be done under the Contract, and all and singular the provisions and conditions of the Contract and of the Bond accompanying it shall apply to the said extra work as if the same were specified in the Contract.

As a condition precedent to the right to receive any money for extra work and material furnished under the Contract, the Contractor shall deliver to the Board, before the 15th day of the month following a month in which any such extra work has been done or extra material furnished, an itemized bill of the cost of such materials or work, accompanied by the order of the Engineer in writing, or copy thereof, ordering such work; and unless it is so filed the claim for Extra Work shall be deemed waived.

Work done and materials furnished under this section shall be paid for upon the succeeding progress estimate, without deduction, under Item 93, Extra Work.

Note.—For accounting purposes of the District, entries of charges to Extra Work shall be classified and made, wherever possible, under appropriate items of the Detail Specifications.

0.20 Progress Estimates.—In order to assist the Contractor to prosecute the work advantageously, the Engineer shall, from time to time, during the active progress of the work, approximately once a month, make a determination of all work done and materials incorporated in the work by the Contractor up to that time, and a progress estimate, in writing, showing: The value of such work and materials under and according to the terms of the Contract; any other amounts due the Contractor, all deductions or reservations made in accordance with the provisions of the Contract; then, from the balance, a deduction of 10 per cent of such balance, or a larger percentage, if in the opinion of the Engineer the protection of the District so requires; then, from the remainder, a deduction of the total amount of all previous payments, and finally, the amount due the Contractor under such progress estimate. Such progress estimates shall not be required to be made by strict measurements, but they may be made either by measurement or by approximation. Progress estimates may, at any time, be omitted if, in the opinion of the Engineer, the protection of the District so requires.

Estimates of value of not to exceed 90 per cent of their cost may be included in the body of the estimate for material paid for and in-

tended for use in the work delivered at the site of the work, provided that if such material shall greatly exceed the amount required for the succeeding month's consumption or use, or if material is delivered so far in advance that it may suffer damage or depreciation before being used, no estimate or allowance for the excess shall be made, if the Board so elects.

In case work is nearly suspended or in case only unimportant progress is being made, the Engineer may, at his discretion, make progress estimates at greater intervals than once a month.

Upon such progress estimate being made and certified in writing to the Board, the District shall, within 10 days after the date of the estimate, pay to the Contractor the amount due him under such estimate; provided, however, that the District may at all times reserve and retain from such amount, in addition to the 10 per cent heretofore mentioned, any sum or sums which, by the terms hereof, or of any law of the State of New Mexico, it is or may be authorized or required to reserve or retain.

0.21 Final Payment.—Whenever, in the opinion of the Engineer, the work covered by this Contract has been completed, he shall so certify in writing to the Board, and shall submit a final estimate, showing the total amount of work done by the Contractor, and its value under and according to the terms of the Contract; any other amounts due the Contractor; all deductions and reservations made in accordance with the provisions of the Contract; the total of all previous payments; and the amount due the Contractor under such final estimate. On or before the expiration of 30 days after date of the acceptance of the work by the Board, the District shall pay to the Contractor the amount due him on the final estimate, except as otherwise provided by law. Provided, however, that before he shall be entitled to payment of such amount, the Contractor shall execute and file with the Board, a release, in proper form, of all claims against the District on account of the Contract, except for the Contractor's equity in the amounts kept or retained under the terms of the Contract; and except for the interest, if any, due on the final estimate, as provided hereinafter; and except any other claims that have theretofore been filed in accordance with the provisions of the Contract, which are listed and itemized in detail in a statement attached to and made a part of such release, giving reasons for, nature of, and amount of each claim so listed. All prior estimates upon which payment may have been made shall be superseded by the final estimate.

0.22 Payment by Check.—Payment may be made by check signed by the properly authorized officers of the District. The Contractor shall designate some bank or other agent within the limits of the Middle Rio Grande Conservancy District, authorized by him to re-

ceive payments on progress estimates, unless otherwise agreed upon between the Contractor and the Board.

0.23 Delayed Payments.—Should any payment due the Contractor on any estimate be delayed, through fault of the District, beyond the time stipulated, such delay shall not constitute a breach of contract or be the basis for a claim for damages, but the District shall pay the Contractor interest on such amount at the rate of 7 per cent per annum for the period of such delay. The term for which interest will be paid upon progress estimates shall be reckoned from the tenth day after the date thereof; and interest upon the final estimate shall be reckoned from the thirtieth day after the acceptance of the work. The date of payment of any estimate shall be considered the day on which the payment is made or offered as evidenced by the records of the Board's office. If interest shall become due on any progress estimate, the amount thereof, as determined by the Board shall be added to a succeeding estimate. If the interest shall become due on the final estimate, it shall be paid on a supplementary voucher prepared by the Board; provided, however, that the Contractor shall not be entitled to interest on any sum or sums which by the terms hereof the District may be authorized to reserve or retain.

0.24 Payment Only in Accordance With Contract.—The Contractor shall not demand, nor be entitled to receive, payment for the work or materials, or any portion thereof, except in the manner set forth in the Contract, and after the Engineer shall have given a certificate for such payment.

0.25 Money Retained for Defects and Damages.—The Contractor shall pay to the District all expenses, losses and damages incurred in consequence of any defect, omission, or mistake of the Contractor or of his employees, or the making good thereof, and the District may apply any moneys which otherwise would be payable at any time hereunder, to the payment thereof.

0.26 Claims for Damages.—Except as otherwise specifically provided in the Contract, it is agreed that if the Contractor shall claim compensation for any alleged damage by reason of the acts or omissions of the Board, or its agents, he shall, within 10 days after the sustaining of such damage, make a written statement to the Engineer of the nature of the alleged damage. On or before the last day of the month succeeding that in which any such damage is claimed to have been sustained, the Contractor shall file with the Engineer an itemized statement of the details and amount of such damage, and upon request of the Engineer shall give him access to all books of accounts, receipts, vouchers, bills of lading and other books or papers containing any evidence of the amount of such damage. Unless such statement shall be filed as thus required, his claim for compensation

shall be forfeited and invalidated, and he shall not be entitled to payment on account of any such damage.

0.27 Remedies Cumulative.—Any means of enforcing performance of the Contract provided herein shall be taken and construed as cumulative; that is, as additional to each and every other such means herein provided.

0.28 Acceptance Shall Not Constitute Waiver.—No order, measurement, determination, or certificate by the Engineer, or order by the Board for payment of money, or payment for, or acceptance of the whole or any part of the work by the Engineer or the Board, or extension of time, or possession taken by the Board or its employees, shall operate as a waiver of any portion of this Contract or of any power herein provided, except as provided for in Section 0.8 of these Specifications, entitled Retaining Imperfect Work; nor shall any waiver of any breach of the Contract be held to be a waiver of any other or subsequent breach.

0.29 Collateral Works.—The Board reserves the right to have such agent or agents as it may elect enter the property or location on which the works herein contracted for are to be constructed or installed, for the purpose of constructing or installing such collateral works as said first party may desire, or for the construction or reconstruction of railroads, telephone and telegraph lines, highways or other works affected by the improvement. Such collateral works will be constructed or installed with as little hindrance or interference as possible with the Contractor. The Contractor hereby agrees not to interfere with, or prevent the performance of, any collateral work by the agent or agents of the Board.

0.30 Persons Interested in Contract.—The Contractor hereby declares that no other person or corporation has any interest hereunder as Contractor.

This Contract shall be void if any member of the Board of Commissioners of the Middle Rio Grande Conservancy District, or other officer of the District, or any person in the employ of the Board of Commissioners, or of the District, is, or shall become, directly or indirectly, interested as contracting party, partner, stockholder, surety or otherwise, in the performance of the Contract, or in the supplies, work or business to which it relates, or in any portion of the profits thereof; provided, however, that incidental and unintentional interest, such as ownership of stock or interest in a railroad, telephone, electric traction or other company which may, as an incident to its usual business, furnish services or supplies to the Contractor, shall not be included within the meaning of this provision.

0.31 Personal Attention of Contractor.—The Contractor shall

give his personal attention constantly to the faithful prosecution of the work, and shall be present, either in person or by a duly authorized representative on the site of the work, continually during its progress. He shall maintain an office on or adjacent to the site of the work, and shall at all times keep in said office a complete copy of the Specifications and Drawings.

0.32 Agents, Superintendents and Foremen.—When the Contractor is not present on any part of the work where it may be desired to give directions, orders may be given by the Engineer and shall be received and obeyed by the Superintendent or Foreman who may have charge of the particular part of the work in reference to which orders are given.

0.33 Contractor's Address.—Both the address given in the bid or proposal upon which the Contract is founded, and the Contractor's office at or near the site of the work are hereby designated as places to either of which notices, letters and other communications to the Contractor shall be mailed or delivered. The delivering at either of the above named places of any notice, letter or other communication from the Board or its Agents to the Contractor shall be deemed sufficient service thereof upon the Contractor, and the date of said service shall be the date of such delivery. The first named address may be changed at any time by notice from the Contractor to the Board. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter, or other communication upon the Contractor personally.

0.34 Compliance With Laws.—The Contractor shall keep himself fully informed of all laws, ordinances, and regulations in any manner affecting those engaged or employed in the work, or the materials and appliances used in the work, or in any way affecting the conduct of the work, and of all orders and decrees of bodies or tribunals having jurisdiction or authority over the same. He shall at all times himself observe and comply with, and shall cause his agents and employees to observe and comply with, such existing and future laws, ordinances, regulations, orders and decrees; and shall protect the District against any claim or liability arising from or based upon the violation of any such law, ordinance, regulation, order or decree, whether by himself or his employees.

0.35 Explosives—Storage and Use.—All explosives shall be stored and used subject to the laws of the State of New Mexico and shall be stored and used subject to the provisions and ordinances of the various cities and towns which now are or may hereafter be in force, when applicable. Explosives shall not be stored in quantities in excess of the amount required for a reasonably immediate use. The contractors shall exercise the highest degree of care and the best ap-

proved methods in the storage and use of explosives, and shall be responsible for all lawful claims for damage incurred in the use thereof and shall save the Middle Rio Grande Conservancy District free and harmless in any event, from any claim for damage arising either from the use or storage of explosives.

0.36—Character of Employees.—The Contractor shall employ only competent, skillful, faithful and orderly men to do the work, and whenever the Engineer shall notify the Contractor, in writing, that any man on the work is, in his opinion, incompetent, unfaithful, disorderly or otherwise unsatisfactory, the Contractor shall discharge such man from the work, and shall not again employ him, except with the written consent of the Engineer.

0.37 To Guard Against Accidents.—The Contractor, at all times throughout the performance of the Contract, shall take all precautions necessary to prevent any accident in any place affected by his operations in consequence of the work being done under the Contract, and shall, to this end, put up and maintain suitable and sufficient barriers, signs, lights, or other necessary protection.

Throughout the progress of railroad grading, or track construction and alteration, the Contractor shall employ all the measures ordinarily required by railroad companies for protection on work of this character; including flags, lights, and flagmen, where necessary.

The Contractor shall save harmless the District from any suits or claims of every name or description brought against it, for and on account of any injury or damage to person or property, received or sustained by any person or persons, by or from the Contractor or any duly authorized sub-contractor or any agent, employee or workman, by or on account of work done under the Contract, or any extensions or additions thereto, whether caused by negligence or not, or by or in consequence of any negligence in guarding the same, or any material or explosives used or to be used for the same, or by or on account of any material, implement, appliance or machine used in its construction; or by or on account of any accident or of any act or omission of the Contractor or of any duly authorized sub-contractor or any agent, employee or workman.

The Contractor agrees that so much of the money due him under the Contract as shall be considered necessary by the Board may be retained until all suits or claims for damages as aforesaid have been settled and evidence to the effect has been furnished to the Board.

0.38 Contractor Responsible for Claims.—The Contractor shall assume the defense of, and save harmless, the District from all claims of any kind arising from his operations in the performance of the Contract. But he shall not be held responsible for damage which is inevitable or necessary because of the nature of the work contracted

for, and which does not result in any way from his manner of doing the work.

0.39 Hindrances and Delays.—The risk and uncertainties in connection with the work are assumed by the Contractor as a part of the Contract, and are compensated for in the contract price for the work. The Contractor, except as otherwise definitely specified in the Contract, shall bear all loss or damage for hindrances or delays caused by other contractors or any other cause, during the progress of any portion of the work embraced in the Contract, and also all loss or damage arising out of the nature of the work to be done, or from the action of the elements, inclement weather and floods, or from any unforeseen and unexpected conditions or circumstances encountered in connection with the work, or from any other cause whatever; and except as otherwise definitely specified in the Contract, no charge other than that included in the contract price for the work shall be made by the Contractor against the District for such loss or damage.

Should the work be stopped by order of the Board for any cause other than those authorized in the Contract, then and in that event, such expense as, in the opinion of the Engineer, is caused to the Contractor thereby, other than the legitimate cost of carrying on the Contract, shall be paid by the District.

0.40 Night Work.—Unless otherwise specified or ordered by the Engineer, work may be done by night as well as by day, and night work may be required if necessary in exigencies, or to complete work on which night work is feasible. But no night work of any kind shall be done without the knowledge of the Engineer.

Where night work is in progress sufficient lights shall be provided to safeguard the workmen and the public, and to afford adequate facilities for properly placing and inspecting the materials.

For night work the Contractor shall receive no extra compensation, but the compensation for such work and all expenses incident thereto shall be considered as included in the contract price.

0.41 Delivery of Materials.—Materials to be used for work under the Contract shall be delivered sufficiently in advance of their proposed use to prevent delays, and they shall be delivered approximately in the order required.

The Engineer shall be notified a reasonable time in advance of the proposed manufacture of metal work, so that arrangements may be made for inspection.

0.42 Infringements of Patents.—The Contractor shall be held responsible for any claims made against the District for any infringements of patents by the use of patented articles, or methods, used by him in the construction and completion of the work, or any patented

process connected with the work agreed to be performed under the Contract, or of any patented materials used upon the said work, and shall save harmless the District from all costs, expenses and damages which the District shall be obliged to pay by reason of any infringement or alleged infringement of patents used in the construction and completion of the work.

o.43 Protection Against Claims for Labor and Material.—The Contractor agrees that he will save harmless the District from all claims against it for material furnished or work done under the Contract.

It is further agreed by said Contractor that he shall, if so requested, furnish the Board with satisfactory evidence that all persons who have done work or furnished material under the Contract have been duly paid for such work or material, and when such evidence is demanded and not furnished as aforesaid, such amount as may in the opinion of said Board be necessary to meet the claim of the persons aforesaid may be retained from the money due said Contractor under the Contract until satisfactory evidence be furnished that all liabilities have been fully discharged.

When required by the laws of New Mexico, moneys due the Contractor may be retained for protection against claims.

o.44 Assignment.—The Contractor shall not assign, transfer, convey, sublet or otherwise dispose of the Contract, or his right, title or interest in or to the same or any part thereof, without the previous consent in writing of the Board. If the Contractor shall, without such previous written consent, assign, transfer, convey, sublet or otherwise dispose of the Contract, or of his right, title, or interest therein, to any other person, company or other corporation, or by bankruptcy, voluntary or involuntary, or by assignment under the insolvency laws of any state; the Contract may at the option of the Board be revoked and annulled, and the District shall thereupon be relieved and discharged from any and all liability and obligations growing out of the same to the Contractor, and to his assignee, trustee, or transferee; and no right under the Contract, or to any money to become due hereunder, shall be asserted, excepting as provided herein, against the District, in law or equity by reason of any so-called assignment of the Contract, or any part thereof, or of any moneys to become due hereunder, unless authorized as aforesaid by the written consent of the Board.

o.45 Removal of Equipment.—The Contractor shall not sell, assign, mortgage, hypothecate, or remove equipment or materials which have been installed and which may be necessary for the completion of the Contract, without the consent of the Engineer.

o.46 Suspension of Work if Contract Is Violated.—If the work

to be done under the Contract shall be abandoned by the Contractor, or if the Contract shall be assigned, or placed in bankruptcy, or the work sublet by him, otherwise than as herein specified, or if at any time the Engineer shall be of the opinion, and shall so certify in writing to the Board, that the performance of the Contract is unnecessarily or unreasonably delayed, or that the Contractor is violating any of the conditions or agreements of the Contract, or is executing the same in bad faith or not in accordance with the terms thereof, or is not making such progress in the execution of the work as to indicate its completion within the time specified in the Contract, or within the time to which the completion of the Contract may have been extended by the Board, the Board may notify the Contractor to discontinue all work or any part thereof, under the Contract, by a written notice to be served upon the Contractor as hereinbefore provided, and a copy of which notice shall be given to his Surety, or the authorized agent for the latter; within two weeks from the date of such notice the Contractor shall discontinue the work, or such part thereof as the Board shall designate; whereupon, the Surety may, at its option, assume the Contract, or that portion thereof on which the Board has ordered the Contractor to discontinue work, and proceed to perform the same, and may, with the written consent of the Board, sublet the work or portion of the work so taken over; provided, however, that the Surety shall exercise its option, if at all, within two weeks after written notice to discontinue work has been served upon the Contractor and upon the Surety or its authorized agent. The Surety, in such event, shall take the Contractor's place in all respects, and shall be paid by the District for all work performed by it in accordance with the terms of the Contract; and if the Surety under the provisions hereof shall assume said entire Contract, all moneys remaining due the Contractor at the time of his default, shall thereupon become due and payable to the Surety as the work progresses, subject to all of the terms of the Contract.

Should the Surety not, within the hereinbefore specified time, exercise its right and option to assume this Contract or that portion thereof on which the Board has ordered the Contractor to discontinue work, then the Board shall have the power to complete by contract or otherwise, as it may determine, the work herein described, or such part thereof as it may deem necessary, and the Contractor agrees that the Board shall have the right to take possession of and use any of the materials, plant, tools, equipment, supplies and property of every kind provided by the Contractor for the purpose of his work, and to procure other tools, equipment and materials for the completion of the same, and to charge to the Contractor the expense of said contracts, labor, materials, tools and equipment and expenses incident thereto. The expense so charged shall be deducted by the District out of such moneys as may be due or may at any time thereafter become due the Contractor under and by virtue of the Contract, or any part thereof.

The Board shall not be required to obtain the lowest figures for the work of completing the Contract, but the expense to be deducted shall be the actual cost of such work. Should such expense be less than the sum which would have been payable under the Contract if the same had been completed by the Contractor, then the Contractor shall be entitled to receive the difference; and should such expense exceed the amount which would have been payable under the Contract if the same had been completed by the Contractor, then the Contractor shall pay the amount of such excess to the District on notice from the Board of the excess so due; but such excess shall not exceed the amount due, under the Contract, at the time the Contractor is notified to discontinue said work, or any part thereof, plus the amount of the bond or bonds executed by the Contractor for the performance of the Contract. When any particular part of the work is being carried on by the Board, by contract or otherwise, under the provisions of this section, the Contractor shall continue the remainder of the work in conformity with the terms of the Contract, and in such manner as to not hinder or interfere with the persons or workmen employed, as above provided, by the Board.

o.47 Board for Engineer and Assistants.—In cases where the Contractor maintains a camp for lodging and feeding employees, he shall, when requested, furnish board or lodging to the Engineer and his assistants, and shall charge the District therefor at the rate of Thirty-five Cents (35c) per meal or lodging, or Seven Dollars (\$7.00) per man per week. He shall not furnish such meals and lodging gratis, but shall submit monthly itemized statements to the Engineer of such meals and lodging furnished, for which payment shall be made by the District.

o.48 Workmen's Compensation Insurance.—Workmen's compensation insurance, approved by the Board, will be required at the cost of the Contractor, and in order to insure that no liability may attach to the District for such claims, the District may, if it so elects, require each Contractor to participate in a general compensation insurance policy for the benefit of all Contractors.

o.49 Public Liability Insurance.—

o.50 Police and Sanitary Regulations.—The Contractor and his employees shall promptly and fully carry out the police and sanitary regulations as hereinafter described or as may from time to time be prescribed by the Engineer or by public sanitary officials, to the end that proper work shall be done, good order shall prevail, and the health of employees and of the people using water from the drainage areas, and of the local communities affected by the operations under the Contract, may be conserved and safeguarded. The Contractor shall summarily dismiss and shall not again engage, except with the

written consent of the Engineer, any employee who violates the laws or the police or sanitary regulations.

0.51 Camps.—The Contractor shall if necessary provide suitable and satisfactory buildings and facilities for the housing, feeding and sanitary necessities of the men. Such quarters shall provide an amount and arrangement of space per man which will be sufficient and suitable for the maintenance of cleanliness, decency and health. The Contractor shall also provide suitable stabling for the animals employed upon the work. All such buildings shall be located only at places approved by the Engineer. The stables shall be at an approved distance from the quarters for men.

The Contractor shall provide at convenient points an ample supply of drinking water of proper quality.

In case of temporary camps or work in or near cities or towns, where camps need not be maintained, or of sanitary conveniences away from camp, the provisions concerning camps, drinking water, sanitary conveniences and garbage may be modified to suit the case, upon the consent of the Engineer.

0.52 Garbage and Camp Refuse.—Garbage, both liquid and solid, shall be promptly and satisfactorily removed and disposed of by the Contractor. The Contractor shall keep the buildings, stables, and premises, in clean and sanitary condition, and shall take necessary precautions against flies.

0.53 Medical Service.—The Contractor shall make satisfactory arrangement for medical service, and for the proper care of sick and injured employees. He shall provide at such places as directed, all articles necessary for giving first aid to the injured. The Contractor shall remove from the work or from any camp, any employee or person whose presence is, in the opinion of the Engineer, a danger to the health of other persons.

0.54 Sanitary Examinations.—The Engineer shall have the right, in order to determine whether the requirements of the Contract as to sanitary matters are being complied with, to enter and inspect, in person or by agent, any camp or building or any part of the work, and to cause any employee to be examined or to be vaccinated or otherwise treated; also to inspect the drinking water and food supplied to the employees.

0.55 Compensation for Sanitary Measures.—No direct payment will be made for any work or materials required to meet the sanitary requirements hereinbefore specified, but compensation therefor shall be considered as having been included in the various Unit Prices stipulated in the Agreement.

0.56 Labor on the Pueblo Lands.—The Contractor shall comply with and be responsible for the following provisions in the Agreement between the United States of America and the Middle Rio Grande Conservancy District, providing Conservation, Irrigation, Drainage and Flood Control for the Pueblo Indian Lands in the Middle Rio Grande Valley, New Mexico.

Article 16. The District agrees that in carrying on the construction work of the District on the Pueblo Lands or for their benefit, it will in the employment of laborers, both skilled and unskilled, as well as any other employment which the Pueblo Indians are capable of performing, give preference to the said Pueblo Indians.

Article 27. No laborer or mechanic doing any part of the work on Pueblo Indian lands contemplated by this contract in the employment of the District or any contractor or sub-contractor of said District shall be required or permitted to work more than eight hours in any one calendar day upon such work. For each violation of the requirements of this article a penalty of five (\$5.00) dollars shall be imposed upon the contractor for each laborer or mechanic for every calendar day in which said employee is required or permitted to labor more than eight hours upon said work, and all penalties thus imposed shall be withheld for the use and benefit of the United States; provided that this stipulation shall be subject in all respects to the exceptions and provisions of the Act of June 19, 1912, (37 Stat., 137) relating to hours of labor. The District further agrees that it shall not employ any person undergoing sentence of imprisonment at hard labor.

GENERAL SPECIFICATIONS

0.58 Water Supply.—The Contractor shall provide at convenient points an ample supply of water of proper quality for all the operations required under the Contract.

0.59 Pumps and Drains.—The Contractor shall provide all the necessary pumps, temporary pipes, drains, ditches, and other means of removing water from the excavations or other parts of the work, or for preventing the slopes of excavations or embankments from sliding or caving, and he shall, where necessary, satisfactorily remove the water. All compensation for, and all expenses incidental to, the fulfillment of the provisions of this section, unless otherwise specifically provided, shall be considered as having been included in the prices stipulated in the Agreement.

0.60 Borrow Pits.—The Contractor may, without charge therefor, open gravel pits, sand pits, or other borrow pits upon lands owned by the District, but no materials obtained therefrom shall be estimated or payment under any excavation item except as otherwise specif-

ically provided herein. The location of all borrow pits shall be subject to the approval of the Engineer.

Where permitted, excavations which are not to be lined with concrete may be enlarged beyond the prescribed limits to obtain materials for construction or for other purposes of the Contractor, but such enlargement of the excavations shall not be paid for under any of the excavation items, except as otherwise specifically provided herein; nor shall any direct payment be made for excavations of whatever nature, not a prescribed part of the permanent structures, which may be made for any purposes of the Contract in connection with the plant, equipment or operations incidental to construction.

All enlarged excavations and borrow pits near cities and towns shall be left at the termination of work under the contract in as slightly a condition as practicable. Such excavations and borrow pits shall be shaped and graded as shown on the drawings, or as ordered. No extra payment shall be made for such work, but compensation shall be considered as included under the item for which the materials taken therefrom are used.

o.61

o.62 Protection of Trees.—Trees, shrubs, and other obstructions shall be removed from areas other than the sites of the proposed structures only to the extent directed or permitted. Where required, trees or shrubs which are not to be removed under the Contract shall be satisfactorily protected by the Contractor from injury.

o.63 Materials Obtained From Construction.—Materials obtained from the excavations, or from stripping or other operations, which are suitable and required, shall be used in the construction of embankments as and where shown on the drawings, or permitted, and no payment in addition to the price paid for the original removal shall be made unless such additional payment is stipulated in the Agreement, or elsewhere in these Specifications.

Materials which are not suitable for use, or which, for any reason, are not used in the construction, shall be deposited in spoil banks as directed. Spoil banks shall be located only at points designated by the Engineer and shall be shaped and graded in such manner as to leave the work in slightly condition. Compensation for depositing and grading materials in spoil banks shall be considered as having been included in the prices bid for the excavation, except as provided in Item 26, Extra Haul.

Materials suitable for riprap, slope paving, stone masonry, aggregate for concrete, or other purposes except the construction of embankments and salvaged structural material, shall be stored, if so ordered, at places designated by the Engineer, and the cost of such work over and above that required for depositing the material in embank-

ment or spoil bank shall be paid for as provided in Section 0.19 of the Specifications, entitled Extra Work.

Salvaged structures, structural materials and parts obtained from buildings, railroads, bridges, culverts, power, telephone and telegraph lines, sewers, water and gas pipes, hydraulic structures, fences and farm structures, etc., shall not become property of the Contractor unless so stipulated in the Agreement.

0.64 To Maintain Communications.—The Contractor shall, at his own cost, build and maintain temporary bridges, roads, railroads, power, telegraph, telephone and signal lines, sewers, gas pipes, water pipes and such underground structures, and shall provide for convenient access to the various parts of the work and to adjacent private property which may be affected by the work. He shall provide such temporary fences or guards as may be necessary either to keep live stock on adjoining property from entering the lands occupied by the works, or to make roads and other communications safe by night as well as by day. The provisions of this paragraph shall not apply where permanent alterations in such communications are to be made by the District, or to items specifically provided for or dispensed with in the Contract.

In case, in the opinion of the Engineer, such temporary works are dangerous or insufficient, the Contractor shall bring them to the condition of safety or sufficiency required by the Engineer. He shall not disturb, close or obstruct any existing highways or other communications until he has obtained permits therefor from the Engineer.

The Contractor shall be responsible for the sufficiency and safety of all such temporary works, and shall be responsible for all damage resulting from their insufficiency, either in construction, maintenance or operation.

0.65 Protection of Existing Structures.—The Contractor shall carefully protect from injury any existing buildings, foundations, fills, land, pavement, pipes, conduits, sewers, canals, ditches, drains, cisterns, wells, railway tracks, fences, telephone lines, electric power lines, or other works, property or structures that may be liable to injury by the work covered by the Contract, or by moving equipment in connection therewith, except in so far as the work of the Contract requires their modification or removal. He shall take all precautions necessary for such protection, and shall be fully responsible for, and shall make good, at his own expense, any injury to such works, property or structures that may occur by reason of his operations; except that the Contractor shall not be responsible for unavoidable damage to underground works, structures or property not shown or mentioned in the Drawings or the Agreement.

0.66 Non-Interference With Irrigation Ditches.—Drains, canals,

ditches and other structures to be built will cross or interfere with numerous existing irrigation canals and ditches. The District will make arrangements for such crossings in advance whenever possible. The Contractor shall not cut nor interfere with the operation of canals and ditches unless and until so ordered by the Engineer. Any loss to the Contractor, due to unavoidable expense for labor while waiting for water to be turned out of such canals or while waiting for temporary structures to be installed by others in connection with such crossings, shall be determined by the Engineer and allowance therefor shall be made in the amount of said loss plus 15 per cent thereof, provided the Contractor gives written notice within ten days after the first day of his claim for delay.

o.67 Assistance in Making Tests.—The Contractor shall render such aid as may be required for making tests of the bearing power of earth, and of the character of foundations; for digging test pits; and for making any other excavations for that purpose which may be directed. Such assistance shall be paid for under Section o.19 of the Specifications, entitled Extra Work.

o.68 Excavation—Work to Be Done.—The necessary excavations shall be made for canals, laterals and ditches for irrigation, drainage ditches, river and stream channels, and channel improvements, stripping foundations for embankments, cut-off trenches and pipe trenches, outlet and spillway structures, irrigation and drainage structures, permanent street and highway relocations and alterations, railroad construction, reconstruction and alteration, and for any other purposes necessary for the completion of all work contemplated under the Official Plan.

o.69 Excavation—Classification.—Excavation as indicated on the Drawings or as determined by the Engineer shall be classified as follows:

Class 1—Earth.—Earth, as a name for excavated material, shall include all material which can be removed or loosened by reasonable plowing when a 6-horse plow team is used, and may include any proportion of stones or boulders or detached masses of rock up to one cubic foot, logs, roots and buried timber. No material shall be classified as other than Earth on account of its small quantity, or because of its position. All materials handled by steam shovel or dragline excavator without the necessary use of explosives, shall be classified as Class 1—Earth.

Class 2—Mixed Excavation.—The term Mixed Excavation, as a name for excavated material, shall be used to include all stones or boulders or detached masses of rock more than one cubic foot and less than one-half cubic yard in volume, or solid continuous layers of rock

more than four inches and less than 12 inches thick, alternating with clay or other soft material, and all compacted or cemented material, hardpan, friable shale or partially disintegrated rock in ledge or in mass, and boulder and gravel deposits, which are so compactly united that they cannot be removed or loosened by plowing when a 6-horse plow team is used, but which can be removed or loosened by the use of a moderate amount of explosives. But if, in the Engineer's judgment, an unnecessary amount of explosives shall have been used the Contractor shall not be entitled to a higher classification by reason of the use of such explosives.

Mixtures of any or all classes of materials which, in the opinion of the Engineer, it is impracticable to classify as Class 1, Earth, or Class 3, Rock, either because of the character of the material or because of the method used in its removal, shall be classed as Mixed Excavation.

Class 3—Rock.—Rock, as a name for excavated material, shall be used to include solid ledge rock and shale formations which can be removed properly only by means of explosives, barring, or wedging, or by some other recognized method for quarrying solid rock. It shall include solid boulders or detached masses of rock of one-half cubic yard or more in volume. It shall also include existing concrete, or masonry with mortar joints, which may be removed under instructions. Reinforced concrete will be classified for removal after it has been broken up under the provisions of Section 0.19 of the Specifications, entitled Extra Work, unless otherwise provided in the Agreement.

0.70 Excavation—Limits of.—The Drawings for the various structures show, as nearly as was practicable to determine beforehand, the depths, widths and slopes for the proposed excavations; but all such limits are estimated only, and will be finally determined from the nature of the materials encountered as the work progresses. Where practicable, slight modifications may be made in channel sections to avoid shallow rock excavation. No excavation outside the prescribed limits will be paid for except when so specifically provided.

Where concrete or masonry is to be built without forms against the sides or bottom of an excavation, especial care shall be taken to preserve the remaining material in an undisturbed condition. In such cases the material shall not be disturbed by machinery or by powder within 6 inches of the prescribed limits, unless with the Engineer's written permission. The remainder shall be removed by handwork, only a short time before placing the concrete or masonry. Should any material be removed beyond the prescribed limits, or be so deteriorated or loosened as, in the opinion of the Engineer, to require removal, the resulting spaces shall be refilled at the Contractor's expense with earth or gravel, properly compacted; except that in case of rock formation it

may be required that such spaces shall be refilled with concrete at the Contractor's expense. All material which shall have been loosened outside the prescribed lines shall be removed at the expense of the Contractor, unless allowed to remain by permission of the Engineer.

Should it be found that a foundation on which concrete is to be placed deteriorates with exposure, special care shall be taken not to excavate it until immediately before covering it with concrete.

0.71 Excavation—Finishing Work.—The slopes of all excavations shall be finished to the prescribed lines and grades in a careful and workmanlike manner.

0.72 Excavation—Payment.—The excavation to be paid for shall include the quantity in cubic yards excavated in accordance with the Drawings, Specifications and instructions of the Engineer, measured in excavation unless otherwise specified under the respective items of excavation. Unless otherwise specified under the respective item, payment for excavation will be made to the neat lines only, as shown on the Drawings or as established by the Engineer.

The unit prices stipulated for excavation items shall include the entire cost of making the excavations and of transporting and depositing the excavated materials in embankments or spoil banks as directed, except as provided in Section 0.77 Embankment—Payment, and elsewhere in these Specifications. These unit prices shall cover the cost of the maintenance of the excavations during construction, including damming, pumping, bailing, draining, unwatering and other work necessary; provided, however, that when excavations are made from concrete or other structures the Engineer shall decide, in case the question arises, to what extent the maintenance of the excavation pertains to the excavation item or to the concrete or other item. Sheet-piling left in place by written order of the Engineer will be paid for as provided under Item 50; otherwise the cost of placing and removal of sheeting and bracing shall be included in the price bid for excavation. These unit prices shall also include the cost of all other operations incidental to the excavation, and of the disposal of the materials excavated, except as provided in Section 0.63 of the Specifications, entitled Materials Obtained from Construction. Reexcavation due to slides not caused by carelessness or improper methods on the part of the Contractor shall be paid for at the unit price stipulated for excavation, except as otherwise provided in the Specifications.

In connection with designated excavation items, bids may be received and payments may be made on the basis of different unit prices for work above, and work below, mean low water level. Where such division in payments is to be made, work above mean low water level is indicated by the item number without suffix, while work below mean low water level is indicated by the item number with the suffix

“a”. Mean low water level shall be taken as the elevation shown or designated as such on the Contract Drawings, regardless of the actual level of the water at the time the work is done. Where no mean low water level is shown or designated on the Contract Drawings, or in the Agreement, all excavation shall be paid for as excavation above mean low water level. Excavation items under which separate payment may be made for work below mean low water level, as specified above, are as follows: Items 17a, 18a and 19a, Excavation for Structures; and Items 23a, 24a and 25a, Excavation for Pipe and Structures in River Bed.

0.73 Embankment—Work to Be Done.—Embankments of the classes specified shall include dams, levees, embankments for railroad yards, railroad relocation, streets and highways, and embankments for any other purpose necessary for the completion of all work contemplated under the Official Plan. Classification will be by items as follows:

Item 32, Earth Embankment for Dams.

Item 30, Earth Embankment for Levees (From Borrow.)

Item 31, Earth Embankment for Levees (Placing Only.)

Item 34, Rock Embankment for Dams.

Item 33, Gravel Embankment for Dams.

0.74 Embankment—Preparation of Foundation.—The sites of all embankments shall be prepared as regards clearing, and the removal of buildings and other structures, as specified under Items 2 and 3.

Soil stripping and grubbing, as specified under Item 4 will be required for all embankments under Items 30, 31, 32 and 33, and when, in the opinion of the Engineer, stumps, roots and soil have been sufficiently removed, and material has been uncovered that provides a suitable foundation for the purpose intended, the material so uncovered shall be picked, plowed, or otherwise satisfactorily roughened, as directed, to provide a bond between the foundation and the embankment. No direct payment shall be made for roughening the foundation as provided above, the cost of such work being considered as having been included in the price bid for the embankment construction.

Springs encountered in the base of the embankment shall be satisfactorily controlled by plugging, draining, or otherwise approved methods. When advisable, springs shall be led away from the embankments, as directed. Approved excavation and materials for this purpose shall be paid for under the appropriate items.

0.75 Embankment—Materials to Be Used.—Items 30, 31 and 32, Embankments for levees and dams shall be made of acceptable materials from the excavations, or from borrow pits located on land pro-

vided by the District. Such materials shall be carefully selected and shall contain a sufficient proportion of fine particles to render the embankment reasonably impervious to water. The material shall be sufficiently stable not to slide or slough at the prescribed slopes, under a condition of saturation. Stones weighing over 5 pounds shall be limited to 20 per cent. of volume of embankment, determined separately for each layer, and shall be placed exclusively in a zone of suitable extent adjacent to the back, or downstream slope. Smaller stones may be distributed throughout the embankment, but must be well separated by compacted earth. No frozen material shall be placed in any portion of the embankment by any method whatsoever, nor shall any material be placed on a frozen surface, and operations shall be suspended when, in the opinion of the Engineer, ice conditions are such as to be objectionable. Where feasible to do so, all material from the excavations which are suitable for the purpose shall be placed in the embankment. Care shall be taken that no earth not acceptable for embankment purposes, or any roots, brush or other perishable material be incorporated within the embankment. All timber, posts, trestles, staging, etc., shall be removed to the extent directed by the Engineer.

0.76 Embankment—Finishing Work.—The slopes and tops of all embankments shall be finished to the prescribed lines and grades in a careful and workmanlike manner.

0.77 Embankment—Payment.—Earth work to be measured and paid for as embankment in place shall include the following: Embankments for Dams and Levees, as provided in Items 30, 32, 33 and 34; Embankments for Levees, Placing Only, Item 31; Miscellaneous Embankments, as provided in Item 35; and Backfilling, as provided in Item 37. Payment for all other embankments shall be considered as having been included in the unit prices bid for excavation, and payment therefor shall be made as provided in Section 0.72 of the Specifications, entitled Excavation—Payment; except that minor embankments and spoil banks may be measured and paid for as embankment in place wherever, in the judgment of the Engineer, a more accurate measurement may be obtained in this way than by measurement of the excavation. Payment for embankment in place shall include the quantity in cubic yards deposited in accordance with the Drawings, Specifications, and instructions of the Engineer, and properly placed within the following limits: The prescribed neat limits for embankments, the contour of the natural ground or as left by the stripping, the prescribed limits for excavations the refilling of which is not included for payment under the provisions of Item 37, Backfilling, and the outside neat lines of any structures included within the embankment; in addition to which there shall be placed such overfill as is required for shrinkage and settlement, as provided in the respective

items relating to embankments. No payment shall be made for over-fill.

The unit prices stipulated for embankment items shall cover the entire cost of constructing the embankments, including the cost of picking, plowing or roughening the foundation, excavating from borrow pits, transporting and grading of materials, placing, puddling, draining, compacting, trimming slopes, refilling settlements and depressions, and all labor and materials necessary for doing the work in accordance with the requirements of the Contract, as well as the cost of maintaining embankments until the completion of the Contract. But such prices shall not include the cost of clearing, removal of buildings and other structures, or soil stripping and grubbing, which shall be paid for under Items 2, 3 and 4.

o.85 Concrete—Description.—All concrete shall be composed of cement, fine aggregates, coarse aggregates, and water, of the qualities hereinafter specified, and thoroughly mixed in proportions to be prescribed by the Engineer. The object is to secure dense, impervious concrete and the Contractor shall use only such materials, satisfactorily graded, proportioned, mixed, and placed, as the Engineer may direct. Various admixtures or a special kind of cement may be required for producing a more dense concrete, waterproofing, or other purpose.

To accommodate the mixture to the detail requirements of the work, and to compensate for the variations occurring in the physical characteristics of the different local sands and gravels, the Engineer shall order the proportions modified from time to time as may be necessary to obtain the best results. Except in special cases, the proportions are expected to range between 1 of cement, 2 of fine aggregate, and 4 of coarse aggregate for the richer mixtures; and 1 of cement, 3 of fine aggregate, and 6 of coarse aggregate for the leaner mixtures.

In the construction of gravity section retaining walls and spillways, and other heavy walls, a richer mixture may be required at the exposed face than is used in the back or in the body of the wall. In such case the richer mixture must be of such thickness and so placed as to form an integral part of the wall. No sharp division calling for forms or other separating device will be required. The practice of coating the forms with mortar, or of plastering the face of the finished concrete, to form a smooth surface will not be permitted.

From time to time tests will be made both of the materials in advance of construction, and also of the concrete actually being placed in the work. The Contractor, at his own expense, shall furnish the aggregates, or the mixed concrete, and give such other assistance as may be required in making such tests.

Large stones may be imbedded in concrete at the option of the

Contractor whenever, in the opinion of the Engineer, the introduction thereof will be no detriment to the quality of the work.

o.86 Concrete—Cement.—Cement, unless otherwise stipulated, shall be understood to mean Portland cement, as defined under Item 44, Cement.

The cost of cement shall not be included in the unit prices bid for concrete. Cement will be purchased by the District as provided under Item 44, and will be furnished to the Contractor sufficiently in advance of use to prevent delay on the work, delivered as stipulated in the Agreement. Sacks delivered with cement will become property of the Contractor who will be charged therefor at the rate of eight cents (8c) for each cloth sack, or two cents (2c) less than the refund rate in case it is changed from the present mill rate of ten cents (10c).

Cement shall be stored in such a manner as to permit easy access for proper inspection and identification of each shipment, and in a suitable weather-tight building which will protect the cement from dampness.

The Contractor shall provide storage facilities in an approved location. Storehouses shall be watertight, shall have tight floors a suitable distance above the ground, shall be large enough to permit of keeping on hand a sufficient supply to prevent delays or interruptions to the work by irregular delivery, and shall have sufficient floor space for storing each carload separately, and affording convenient access thereto for sampling, counting of packages and removal.

The Contractor shall employ a competent storekeeper who can speak and understand the English language, who shall have charge of the storehouse, and shall keep suitable records of the delivery and use of all cement. Copies of these records shall be furnished the Engineer at the close of each day's work, showing in such detail as he may reasonably require, the quantity used in each part of the work during the day and the quantity remaining on hand at the close of the day's work.

o.87 Concrete—Fine Aggregate.—Fine aggregate or sand shall be composed of grains from hard, tough, durable rocks, free from soft, decayed, friable or soluble material. It shall be clean, free from injurious quantities of alkali, and shall not contain a sufficient quantity of organic silt, clay or other finely-divided matter to render it unsuitable. If objectionable quantities of silt or other matter adhere to the sand grains, the sand shall be satisfactorily washed. The size of the grains shall be acceptably graded from fine to coarse particles with no grains larger than will pass a one-fourth inch mesh screen. A sufficient proportion of fine particles is a specific requirement. Sand, when mixed into mortar in the proportion by weight of 1 part cement and 3 parts sand, may be rejected if it does not develop within 28 days

a compressive strength at least equal to the strength of a similar mortar made under the same conditions of the same cement and standard Ottawa sand tested at the same age.

o.88 Concrete—Coarse Aggregate.—Coarse aggregate shall consist of clean, hard, durable, insoluble, broken stone, or gravel, of such size as to pass through a screen having 3-inch round holes, and be retained on a one-fourth inch mesh screen, and shall be acceptably graded in size between these limits. Coarse aggregate, as here defined, shall be used in all classes of concrete structures except thin and heavily reinforced sections, in which cases coarse aggregate of smaller size shall be used, as specified under the appropriate Items.

Fragments of approximately the same size, or of flat, elongated shapes, or improperly graded, will not be satisfactory. Such screening, grading and washing shall be resorted to as will produce material of acceptable quality. Run of crusher or run of bank, i. e. gravel or stone containing a mixture of both the fine and coarse aggregates shall not be used without screening and reportioning.

In general the local stones and gravels will be deemed satisfactory for use as coarse aggregate if properly screened and washed, but all such gravel shall be subject to test and approval by the Engineer under the provisions of Section o.90 of the Specifications, entitled Samples.

o.89 Concrete—Large Stones.—Where permitted, clean, sound non-oil-bearing stones of acceptable size may be imbedded in the concrete provided they can be thoroughly incorporated in the mass and surrounded by an acceptable thickness of concrete. Such stones at the moment of placing in the concrete shall be clean, wet, and free from frost, and shall be well bedded by joggling. Projecting parts of such stones shall be cleaned and wet again, if required, before being covered with concrete. Large stones shall not be placed without first having been inspected by the Engineer.

o.90 Concrete—Samples.—Samples of both fine and coarse aggregates which the Contractor proposes to use shall be submitted to the Engineer for approval a sufficient time in advance of use to allow for the necessary tests for determining the suitability of the material for the use contemplated, and for determining the exact proportions required under the various items.

o.91 Concrete—Water.—The water used in mixing concrete shall be reasonably clean and free from oil, acid, injurious quantities of alkali, and vegetable matter. In general, water in the Rio Grande valley will meet these requirements.

o.92 Concrete—Preparation of Foundations.—No concrete shall be placed until the foundation is prepared to the satisfaction of the

Engineer. Springs encountered in the foundation shall be plugged, piped, or otherwise satisfactorily disposed of.

If the foundation is upon rock, the surface shall be scrupulously freed from all dirt, gravel, scale, loose fragments or other objectionable substances. Streams of water under sufficient pressure, and wire brushes or other effective means shall be used to accomplish this cleaning. Steam jets or hot water shall be used to thoroughly remove snow, ice or frost, if any be found upon the foundation when it is desired to lay the concrete.

Earth foundations, if required, shall be thoroughly compacted by rolling or other approved methods, and in no case shall the Contractor deposit concrete on newly placed fills or on such as, in the opinion of the Engineer, are likely to shrink or settle in a manner which may injure the concrete structure. Earth foundations shall be thoroughly and satisfactorily wetted immediately prior to placing the concrete thereon. If frozen, the soil shall be thawed out in a satisfactory manner, and then thoroughly compacted even though it may have been compacted previous to freezing.

0.93 Concrete—Mixing.—The Contractor shall equip his plant and manage his mixing operations in a way to insure the mixtures designated and strict uniformity in the proportion of aggregates, cement and water, and thorough mixing. The Engineer will specify, for each class of work and character of aggregate, all mixtures to the Contractor in terms of the proportions of cement, sand, coarse aggregate and consistency, each to be measured as follows:

Cement.—One hundred pounds of cement shall be considered 1 cubic foot; a barrel, 376 pounds or 3.76 cubic feet; and one sack, 0.94 cubic feet.

Sand.—Measurement of sand by counting shovelfuls, or by wheelbarrows, will not be permitted under any circumstances. The amount for each batch shall be measured by a method dependable to within 3 per cent above or 3 per cent below the specified quantity. Where so shown on the Contract Drawings or in the Agreement, the sand shall be proportioned by weight, by the inundation or other equally accurate method. On the smaller work an open-bottom box, of the proper size, with its depth not less than either other dimension, will satisfactorily measure the sand when struck level at the top. The box may be used in wheelbarrows.

Course Aggregate.—This shall be measured by volume, loose, in an approved chute or hopper with dependable positive control gates.

Consistency.—Consistency of the mixed concrete shall be checked in the field by the slump test. Samples of concrete for this test shall

be taken as it is being deposited in the structure, and carefully rammed into standard moulds consisting of a metal truncated cone 12 inches high with upper and lower inside diameters of 4 and 8 inches respectively. The slump shall be the subsidence in inches of the top surface upon immediate removal of the mould. Ordinarily the slump shall not exceed the following:

1. Mass concrete..... 2 inches.
2. Reinforced concrete:
 - Thin vertical sections and columns..... 6 inches.
 - Heavy sections, and paving on slopes..... 2 inches.
 - Thin confined horizontal sections..... 8 inches.
3. Roads and pavements:
 - Hand finished 4 inches.
 - Machine finished 1 inch.
4. Mortar for floor finish..... 2 inches.

In order to secure uniformity of consistency in consecutive batches, suitable means shall be provided for controlling and accurately measuring the water.

When permitted, small quantities may be mixed by hand in a thorough and satisfactory manner. Otherwise, the mixing shall be done in batches of suitable size, in a batch mixer of approved type, which will insure uniform distribution of the materials throughout the mass and satisfactorily discharge all of its contents at the stiffer consistencies. The mixing of each batch shall continue in the mixer not less than 90 seconds after all the materials, including water, are in the mixer. The mixer shall rotate at a peripheral speed of about 200 feet per minute. Longer mixing may be required if necessary to secure a thoroughly satisfactory mix with the permitted amount of water.

All operations incidental to mixing concrete shall proceed with sufficient dispatch to insure the bonding together of the successive batches as a true monolith.

Except in special cases authorized by the Engineer, concrete which has taken its initial set shall not be retempered and used in the work, but shall be at once discarded and removed.

The right of the Engineer, under Section 0.35, Character of Employees, will be particularly applicable in the mixing operations, and he will remove workmen who do not honestly attempt to conform to the requirements of stiffer concrete and other matters.

0.94 Concrete—Forms.—The Contractor shall provide and maintain in good condition all necessary forms, moulds and centers for shaping the concrete. Such forms shall be true to the required shapes and sizes, properly braced, and strong enough to withstand, without springing or warping, all operations incidental to placing the concrete.

They shall be made mortar-tight, and the faces in contact with the concrete shall be satisfactorily smooth and clean. Forms for exposed surfaces shall be of surfaced and sized lumber. All forms shall, where required, be coated with soap, oil of paraffine base, or other suitable substance. Whenever required, forms shall be thoroughly wet before concrete is placed, in order to prevent injurious drying of the surface of the concrete. Small rods or galvanized iron wires to hold the forms in place may be imbedded in the concrete, provided the ends of such rods or wires are afterwards carefully removed flush with the surface of the concrete or slightly beneath it, without injury to the concrete. Forms more than 6 feet in height shall be tied by rods and nuts, and not by wires. Forms shall not be removed until the Engineer has approved such removal, but the Contractor alone shall be responsible for injury to concrete due to their premature removal. Forms shall be removed with great care, in order to prevent injury to the concrete. Forms unsatisfactory in any respect shall not be used, and, if condemned, shall be removed immediately from the work.

0.95 Concrete—Construction Joints.—Well formed, horizontal or vertical construction joints must be provided at the end of each day's work. Wherever necessary on account of the character of the structure, the work shall be so prosecuted that construction joints will occur only at designated places, and the Contractor shall complete by continuous depositing of concrete, sections of the work comprised between such joints.

0.96 Concrete—Contraction Joints.—Contraction joints, expansion joints, and slip-joints shall be formed where and as directed in concrete structures. In general, such joints shall be made by building smooth surfaces, acceptably coated if required with some approved substance to render them inadhesive, and shall be grooved or otherwise shaped, or shall have metal strips imbedded therein, as directed.

0.97 Concrete—Placing.—Provision shall be made for the rapid transportation of fresh concrete from the point of mixing to the work. Care shall be taken in conveying and depositing concrete to avoid methods which tend to produce a segregation of the component parts.

Concrete shall be deposited in approximately level layers, the thickness of which shall be no greater than will readily permit proper compacting, and with such manipulation as will remove entrained air and surplus water, and produce, from the accepted materials, the most compact, dense and impervious concrete practicable. The concrete shall be well worked against the forms, but excessive spading is prohibited.

Concrete shall not be deposited in water without explicit permission, and then only in strict accordance with directions. Care shall be taken that no water interferes in any way with the proper plac-

ing of concrete, and the Contractor shall not allow water to rise on any concrete until, in the opinion of the Engineer, it has set sufficiently.

All laitance or other undesirable substance shall be removed from the surface of concrete at such times, depending upon weather conditions and rate of hardening, as the Engineer may direct, but preferably from one to two hours after the surface concrete has been deposited. Where new concrete is joined to old, or to rock, the surface of the old concrete or rock shall be thoroughly cleaned, using wire brushes and a jet of water from a hose if necessary, and the surface shall be clean and wet at the moment the fresh concrete is placed. If required, surfaces of concrete previously placed shall be satisfactorily roughened. A wash of neat cement grout shall be scrubbed into the contact surface of the old concrete or the rock with steel brooms immediately before placing concrete and shall be thoroughly worked into all crevices and depressions. When required, a coat of mortar shall be spread over the contact surfaces thus prepared. Provisions for bonding new concrete to old shall be made by the use of forms of such styles and dimensions as to properly form the concrete joints into steps, dovetails, grooves, or other ordered shapes. Where required large stones, dowels, or steel reinforcing rods shall be imbedded in concrete for bonding new work to old. Steel so used shall be furnished or paid for by the District.

0.98 Concrete—Finishing Surfaces.—Unless otherwise specified, all concrete surfaces which are to remain permanently exposed shall be given a neat appearance, by removing in an approved manner all rough edges and projections. Honey-combed areas shall either be pointed up with cement mortar or taken out, as the Engineer may direct, and the spaces refilled with concrete or mortar. Recesses formed by the removal of defective concrete shall be refilled with concrete as specified in Section 0.101 of the Specifications, entitled Concrete—Replacing Faulty Work. The practice of patching and plastering, or washing with cement grout is to be discouraged and shall be done only under the specific orders and direction of the Engineer.

Exposed surfaces which are not cast against forms shall be brought to proper lines and grades and finished with a wood float. All exposed edges shall be rounded by the skillful use of a suitable edging tool. Excess water shall be promptly drained or otherwise removed. Overtroweling shall be avoided.

0.99 Concrete—Cold Weather Precautions.—Concrete shall not be mixed or deposited during freezing weather without the specific direction or permission of the Engineer. When so directed or permitted, approved precautions shall be taken for removing snow, ice, or frost from the materials and from the surfaces upon which the concrete is

to be placed. The water and aggregates shall be heated, and satisfactory provisions shall be made for keeping the fresh concrete from freezing, including adequate coverings, steam pipes or other appliances and materials. Such protection of concrete shall continue until, in the opinion of the Engineer, there will be no further danger from freezing. The laying of concrete may, however, be prohibited at any time when, in the judgment of the Engineer, the conditions are unsuitable or the proper precautions are not being taken.

o.100 Concrete—Protection and Curing of.—It is a rigid requirement that all concrete shall be kept moist continuously for at least four (4) weeks.

The surfaces shall be protected against direct rays of the sun for at least one (1) week to prevent cracking and crazing, due to lack of surface moisture. To this end the surfaces shall be covered with earth, canvas, burlap, or other equally effective material, and shall be thoroughly sprinkled with sufficient frequency to preclude any possibility of drying. Alternate drying and wetting shall be particularly guarded against.

Great care shall be exercised at all times to prevent injury to concrete surfaces which will be exposed in the finished work. The Contractor shall not permit working or walking over or upon finished surfaces of concrete until hardened sufficiently to resist damage. The Contractor may, at any time prior to final acceptance of the work, be required to clean all exposed surfaces of concrete.

o.101 Concrete—Replacing Faulty Work.—If, upon removing the forms, moulds, or centers, any voids or other imperfections be found, such faults shall be corrected by the Contractor without additional cost to the District, by patching or other methods, as directed, even to the extent of taking down and replacing unsatisfactory concrete; or if any forms shall fail or become displaced, and as a result the section of concrete contained therein shall be injured or out of line or be subjected to premature stresses, the Contractor, without additional cost to the District, shall satisfactorily replace so much of said section of concrete as the Engineer may deem necessary, even to the extent of rebuilding the entire section.

o.102 Concrete—Placing Metal Work.—There shall be imbedded in, or set in, or attached to the concrete wherever directed, reinforcing steel, structural steel shapes, castings, piping or other metal objects shown on the Drawings, required by these Specifications or ordered. The concrete shall be packed tightly around metal work to prevent leakage, and to secure perfect adhesion, and all necessary precautions shall be taken to prevent these objects from being loosened, displaced, broken or deformed. It is a rigid requirement that reinforcing steel, structural steel, anchor bolts, etc., must be placed and held exactly to

the locations and dimensions shown on the Drawings. If any error is discovered in the bending of reinforcing steel, it shall be immediately reported to the Engineer.

0.103 Concrete—Measurement for Payment.—The quantities of concrete to be paid for shall be the number of cubic yards of concrete deposited in place in accordance with the Drawings, Specifications, and instructions of the Engineer. Whenever the structures are of such types that concrete is to be built against the sides of any excavation, the concrete shall be measured as if the excavation were made exactly to the prescribed lines. Any rubble or brick masonry used by permission of the Engineer for convenience in setting pipes or other objects, or for other purposes in connection with concrete structures, and any mortar used with approval in the laying of any such masonry, shall be measured and paid for as of the class of concrete in which it is used.

In connection with designated items covering concrete construction, bids may be received and payments may be made on the basis of different unit prices for work above, and work below, mean low water level. Where such division in payments is to be made, work above mean low water level is indicated by the item number without suffix, while work below mean low water level is indicated by the item number with the suffix "a". Mean low water level shall be taken as the elevation shown or designated as such on the Contract Drawings, regardless of the actual level of the water at the time the work is done. Where no mean low water level is shown or designated on the Contract Drawings, all concrete construction shall be paid for as work above mean low water level. Items covering concrete construction under which separate payment may be made for work below mean low water level, as specified above, are as follows: Item 39a, Plain Concrete Structures; Item 40a, Reinforced Concrete Structures; Item 41a, Monolithic Concrete Slope Pavement; and Item 42a, Precast Concrete Slope Pavement.

0.104 Concrete—Prices to Include.—Except for the furnishing of cement, and the furnishing and placing of reinforcing steel and other metal work, as provided elsewhere, the unit prices for the different items of concrete shall cover the entire cost of construction thereof, which shall include: The cost of materials for fine and coarse aggregates, and of large stones; the cost of all mixing, conveying, placing of concrete and large stones; the cost of handling and use of admixtures where required; the cost of damming, bulkheading, pumping, bailing; the cost of preparing foundations, piping, or otherwise caring for water, and removing laitance; the cost of grout wash or mortar beds used in building upon old work or on rock, and of paint coatings for contraction joints; the cost of protecting concrete against frost, floods and injury from other sources; the cost of erecting and

removing forms, centers, moulds, bracing, landing platforms and scaffolds, and of the lumber, nails, wire and other material used therein; the cost of finishing, patching, and wetting; the cost of removing and replacing defective work; the cost of handling and transporting cement from the point of delivery designated in the Agreement to the site of the work, and responsibility for storage of cement at the site; the cost of placing, but not of furnishing, vitrified pipes and other drains other than metal in the concrete structure; and any other work and materials necessary to complete the concrete construction as required by the Contract.

But such unit prices shall not include the cost of furnishing cement, or of furnishing and placing reinforcing steel, steel piping and conduits, structural steel, castings and other metal work, which shall be paid for under the items provided therefor.

As the cement is to be furnished by the District, or paid for separately as a distinct item, the Contractor shall make no claim for extra payment because of variations in mixture, the unit price for concrete being understood to apply to any mixture which may be required.

Sacks delivered with cement will become property of the Contractor who will be charged therefor as provided in Section 0.86 of these Specifications.

0.105 Mortar.—Mortar shall consist of Portland cement, fine aggregates and water, mixed in such proportions as the Engineer may direct. The cement, fine aggregates and water shall conform to the specifications for these materials for concrete, except that the fine aggregate in mortar used for filling joints of pipes or brick masonry shall have no grains larger than will pass a $\frac{1}{8}$ -inch mesh screen.

Payment for mortar will not be made separately, but will be included in the unit price of the concrete, masonry, pipe, or other work in which it is used; except that the cement, unless otherwise stipulated in the Detail Specifications or Agreement, will be furnished or paid for by the District.

0.110 Steel Plates.—Steel plates shall meet the specifications of flange steel grade, Serial Designation A-30-24 of American Society for Testing Materials, or of flange grade boiler steel of the American Steel Manufacturers Standard Specifications, revised November 24, 1922.

All plates shall be free from laminations or surface defects and be to full gage on the edges, standard variations being allowed. Any plate that develops defects during the process of punching, bending, and riveting, incident to fabrication or erection, shall be rejected notwithstanding that the same has satisfactorily passed specified tests.

0.111 Gage Steel Plate.—Steel plate for metal culverts and flumes shall be made from open hearth base metal conforming to any of the following chemical requirements:

CHEMICAL COMPOSITION

Position of base metals does not indicate preference.

Elements	Pure Iron	Copper Bearing Pure Iron	Copper Iron	Copper Molybdenum Iron	Copper Steel	Tolerance by check analysis
Carbon	—	—	—	—	—	—
—max.	—	—	—	—	—	—
Manganese	—	—	—	—	—	—
—max.	—	—	—	—	—	—
Phosphorus	.015	.015	.015	.015	—	—
—max.	.015	.015	.015	.015	—	—
Sulfur	.040	.040	.040	.040	.050	.010
—max.	.040	.040	.040	.040	.050	.010
Silicon	—	—	—	—	—	—
—max.	—	—	—	—	—	—
Copper	—	.20	.20	.40	.20	.02
—min.	—	.20	.20	.40	.20	.02
Molybdenum	—	—	—	.05	—	—
—min.	—	—	—	.05	—	—
Sum of first five elements	—	.10	.25	.25	.70	.04
—max.	—	.10	.25	.25	.70	.04
Sum of first six elements	.10	—	—	—	—	.04
—max.	.10	—	—	—	—	.04

The plates shall be galvanized unless otherwise specified. The base metal sheets shall be uniformly galvanized on both sides by the hot process. A uniform coating of Prime Western Spelter shall be applied at the rate of not less than two (2) ounces per square foot of metal. If the average spelter coating, as determined from samples, shows less than two (2) ounces of spelter per square foot of metal, or if any one sample shows less than 1.8 ounces of spelter per square foot of metal, the shipment shall be rejected. Sheets having blister spots, holes or other imperfections in the galvanizing after corrugating shall be rejected.

The tests for weight of spelter coating shall be made as described in the Standard Methods of Sampling and Testing of the American Association of State Highway Officials.

All sheets shall be marked by a stamp showing:

- 1st. Name of sheet manufacturer.
- 2nd. Name of brand.
- 3rd. The gage.

When not otherwise provided, laboratory tests shall follow the methods of the American Society for Testing Materials. The analysis

made by the chemists or inspection bureau designated or approved by the Engineer shall be taken as final, but before any considerable shipment is rejected a check analysis shall be made.

Depth of corrugations shall not be less than one-half ($\frac{1}{2}$) inch and the pitch shall not exceed two and three-fourths ($2 \frac{3}{4}$) inches.

0.112 Structural Steel.—Structural steel shall conform in physical properties and manufacture to the General Specifications for Steel Railway Bridges, as adopted by the American Railway Engineering Association, 1920, Appendix A.

0.113 Steel.—Where “steel” only is specified, the Contractor may use any first-class grade of commercial carbon steel best suited for the purpose for which the part is to be used.

0.114 Bolts and Rivets.—Steel used for rivets shall conform in physical properties and manufacture to the General Specifications for Steel Railway Bridges, as adopted by the American Railway Engineering Association, 1920, Appendix A, or the Standard Specifications for Boiler-rivet steel, Serial Designation A-31-24 of the American Society for Testing Materials.

0.116 Iron Castings.—Iron castings shall be of gray iron made by the cupola process, free from injurious defects, and shall be smooth and well cleaned before inspection. They shall be commercially machinable, and shall not be plugged or welded without permission from the inspector. Such permission will be given only when the defects are small and do not adversely affect the strength, use, or machinability of the castings. In all respects, not specifically mentioned herein, the castings shall conform to the “United States Government Master Specification for Gray Iron Castings”, Federal Specifications, Board Specification No. 141, adopted May 1, 1924. Iron castings for bridges shall conform in physical properties and manufacture to the General Specifications for Steel Railway Bridges as adopted by the American Railway Engineering Association, 1920, Appendix A.

All castings shall be true to pattern, free from cracks, cold shuts, excessive shrinkage, and other injurious defects. No porosity will be allowed in positions where the strength of the casting will be impaired. All sand shall be removed before the castings are machined and painted.

0.117 Semisteel Castings.—Castings shall be made by the cupola process, free from injurious defects, and shall be smooth and well cleaned before inspection. They shall be free from hard spots and shall be annealed in a furnace, if necessary, to secure satisfactory machinability. Castings shall not be plugged or welded without permission from the inspector, and such permission will be given only when the defects are small and do not adversely affect the strength, use, or

machinability of the castings. In all respects not specifically mentioned herein, the castings shall conform to the "United States Government Master Specification for High-Test Gray Iron Castings (Semisteel)", Federal Specifications, Board Specifications No. 140, adopted May 1, 1924.

0.118 Steel Castings.—Steel castings shall be sound and free from injurious defects. They shall be well cleaned, with heads and gates removed for inspection in the green. When heads and gates are removed by burning, this burning shall be done at least one-half inch from the body of the casting, the remaining metal to be removed by grinding, cutting, or machining. Castings shall not be repaired, plugged, or welded without specific authority from the inspector. Such permission will be given only for welding to be completed prior to final heat treatment, and when the defects, after being thoroughly cleaned out to sound metal, are judged not to affect the strength, use or machinability of the castings. Castings shall be annealed in a properly constructed pit or furnace, and they shall be held at the treatment temperature at least long enough for each casting to be uniformly heated throughout its mass. They shall not be removed from the furnace until they have been cooled down to a temperature of about 700° F. Rapid cooling of castings, or any further heat treatment other than reannealing, shall not be undertaken without specific authority from the Engineer. All castings shall be annealed so that the fracture of any part shall show to the eye a fine-grain structure. They shall be well cleaned for final inspection. In all respects not specifically mentioned herein, the castings shall conform to the "United States Government Master Specification for Steel Castings (Medium Grade)", Federal Specifications, Board Specification No. 170, or Standard Specifications for Steel Castings, Serial Designation A-27-24 of the American Society for Testing Materials.

0.119 Bronze Castings.—Bronze castings shall be made only from the best grades of virgin metals. The use of scrap metal will not be allowed. They shall be of uniform quality free from flowholes, porosity, hard spots, shrinkage defects, cracks, or other injurious defects, and shall be smooth and well cleaned before inspection. Castings shall not be repaired, plugged, or welded without permission from the inspector. Such permission will be given only when the defects are small and do not adversely affect the strength, use, or machinability of the castings.

Where "bronze" only is specified on the Drawings, except for nuts, the castings may be made of either grade No. 5 or grade No. 6 bronze. In all respects not specifically mentioned herein, bronze castings shall conform to the "United States Government Master Specification for Bronze Castings", Federal Specifications, Board Specification No. 172a.

Grade 5.—Ultimate tensile strength 40,000 pounds per square inch, elongation 20% in 2 inches.

Grade 6.—Ultimate tensile strength 35,000 pounds per square inch, elongation 18% in 2 inches.

Yield point, grades 5 and 6, 50% of tensile strength.

0.120 Cold-Finished Steel Shafting.—Cold-finished steel shafting shall conform in all respects to the current "Standard Specifications for Commercial Bar Steels" of the American Society for Testing Materials. It shall be made of cold-finished bars, turned and polished, open-hearth grade, 20-30 carbon.

0.121 Babbitt.—All babbitt shall be of first quality, "hard genuine" tin-base babbitt, and shall be of a recognized brand approved by the Engineer. No scrap or melted babbitt will be accepted or used.

0.124 Metal Work—Punching and Subpunching.—Holes for shop rivets may be punched, unless otherwise specified, to full size without reaming, and shall be one-sixteenth inch larger in diameter than the nominal diameter of the rivet. Holes must be accurately placed, clean cut, without torn or ragged edges. Poor matching of holes may be cause for rejection. Punching for joints that must be water-tight shall be from the surfaces to be in contact, unless otherwise permitted in writing.

Holes for field rivets and bolts shall be subpunched one-sixteenth inch smaller and reamed to one-sixteenth inch larger than the nominal diameter of the rivet. Outside burrs shall be removed with a tool making a one-sixteenth inch fillet. Reaming shall be done only after the pieces to be connected are completely assembled in the shop with all parts so firmly bolted together that the surfaces are all in close contact. No interchange of reamed parts will be permitted.

0.125 Metal Work—Riveting.—Wherever possible all rivets shall be machine driven. In all cases where the cold rivet cannot be entered without the aid of driftpins the holes shall be reamed with a twist reamer. Drifting will not be allowed. All rivets must completely fill the holes. Rivet heads shall be neatly formed with dies of proper size and of uniform size for the same size rivets throughout the work. They shall be concentric with the rivets and must thoroughly pinch the connected pieces together. Rivets one-half inch in diameter and larger shall be heated uniformly to a light cherry red and driven while hot. When heated and ready for driving they shall be free from slag, scale, and carbon deposit. Recupping and calking will not be allowed. Defective rivets shall be replaced. On removing rivets care shall be taken not to injure the adjacent metal, and if necessary the rivets shall be drilled out.

The effective diameter of any rivet shall be assumed the same as its diameter before driving, but in making deductions for rivet holes in tension members the diameter of the hole shall be assumed one-eighth inch larger than that of the undriven rivet.

0.126 Metal Work—Calking.—Plates shall be bevel sheared to an angle of about 70 degrees, after punching, along all edges to be calked. All calking shall be done with a round-nosed tool and the workmanship shall be in accordance with the best modern shop practice. The calking edge shall be drawn tight against the connecting plate before calking is done. The plate underneath the calking edge shall not be scored and the calked sheet shall not be split.

0.127 Metal Work—Painting With Water Gas Tar.—Before painting, all surfaces shall be thoroughly cleaned of all mill scale, rust and oil. The water gas tar shall have a specific gravity of not less than 1.04 or more than 1.10 at 60° F., and shall be applied when the temperature of neither the air nor the metal is less than 60° F. It shall be of such consistency that it can be applied with brushes, and shall be free from moisture and fats.

0.128 Metal Work—Painting With Red Lead.—After fabrication and before shipment, all parts shall be thoroughly cleaned of all dirt, rust, grease and loose scale, and shall be given one shop coat of the paint, well worked into all joints and open spaces. On all riveted work the surfaces coming in contact shall be separately painted with one coat of the paint before being riveted together. Pieces and parts which are not accessible for painting after erection, including ends of girders, ends of posts, tops of stringers, etc., shall be given two coats of paint before leaving the shop.

No painting shall be done in wet weather unless under cover. Painting on cars will not be permitted and material shall not be loaded on cars and shipped until at least 24 hours have elapsed after painting.

Shop painting shall not obliterate the identification marks which shall be made upon surfaces previously oiled or painted, so that when the metal work leaves the shop there shall be no spots left unoiled or unpainted.

The paint shall be made by thorough mechanical mixing of 25 pounds of red lead with each gallon of pure boiled linseed oil. To each gallon of this paint there shall be added, during mixing, one-fourth ounce of pure lamp black, ground in oil, to tone down the finished color. It shall not be thinned with gasoline, benzine or turpentine, and no adulterant or dryer whatsoever shall be used in its manufacture or application. It shall be mixed only in small quantities sufficient for immediate use.

0.132 Metal Work—Tolerances and Machine Work.—Tolerances and clearances specified on the Drawings shall be closely adhered to,

and the machine work shall be carefully performed, with surfaces smooth and practically free from tool marks. Where tolerances are not specified on the Drawings, the Contractor shall follow the best modern shop practice for apparatus of the type covered by these specifications, due consideration being given to the special nature or functions of any parts, and to the corresponding accuracy required to secure proper operation.

0.133 Metal Work—Finish for Bolts, Studs, and Nuts.—Bolts, studs, and nuts will be of two classes—semifinished and finished, as follows:

(a) Semifinished bolts and nuts shall be die-chamfered, machined under head and nut, threaded, with the head of the bolt concentric with the body, and the faced side at right angles to the body.

(b) Finished bolts, studs, and nuts shall be machined throughout, threaded, with head chamfered, concentric with and at right angles to the body of the bolt.

DETAIL SPECIFICATIONS

Item 1

River Diversion During Construction

1.1 Description.—Under this item shall be included all work and material and all uses of the resources of the Contractor which may be necessary in order to adapt the work to the safe control of the flow of streams during construction, and until the entire work is fully completed; the object being to secure the safety of life and property, and to prevent damage or delay of completion which might result from inadequate steps being taken under this item.

1.2 Methods and Equipment.—The Contractor shall prepare his own plans and methods for carrying out the requirements of this item, and shall be responsible for the effectiveness of such plans and methods. Such plans and methods shall be submitted to the Engineer for his approval; but such approval shall cover only the right of the Contractor to proceed with the work. The Contractor shall have no claim or charge against the District because of any unforeseen expense in building or rebuilding work resulting from the necessities or results of stream control operations.

1.3 Payment.—The payment under this item, not included in the five cases specified below, shall be a lump sum specified for this item in the Agreement.

First. Riprap, where ordered or approved, shall be paid for under Item 29, Riprap.

Second. Removing ordered or approved riprap within the limits of an embankment, and excavating slope of embankment to make satisfactory bond between old and new work, shall be paid for under Items 17 and 17a, Excavation for Structures, provided that should the slopes become steeper than is permitted, due to undercutting or erosion in any form, the sides of a stream-control gap shall be excavated to the required slope at the Contractor's expense.

Third. Preparing the stream bed for embankment shall be paid for under Item 2, Clearing, or Item 4, Soil Stripping and Grubbing, or both, except that removal of ordered riprap will be paid for as provided in the preceding paragraph.

Fourth. Excavation in inlet, or outlet, or channel, of a stream-control gap, where ordered, shall be paid for under Items 8, 9, and 10, Excavation of Canals and Laterals, according to the class of material excavated.

The lump sum stipulated for Item 1 shall be paid when the dam, channel or levee is fully completed, and when, in the opinion of the Engineer, no further work under this item will be required. It shall be

considered full compensation for all services, labor, material and equipment, and for all the resources of the Contractor used for, or incidental to, the operations under this item; and for all risks and damages connected therewith.

In case any of the material placed or work done in connection with stream control, or affected thereby, shall be washed out or damaged at any time before the completion of the Contract, it shall be replaced or made good by the Contractor without additional expense to the District.

Item 2

Clearing

2.1 Description.—Such portions of the sites of embankments, canals and drain ditches, railroad and highway rights-of-way, borrow pits, excavations to be used for embankment material, and other areas, as the Engineer may designate, shall be cleared, to the surface of the ground, of all trees, stumps, bushes, and other similar encumbrances.

2.2 Disposal of Materials.—Materials obtained from the clearing operations shall be the property of the Contractor unless otherwise specified, and must be removed from the vicinity of the work or otherwise satisfactorily disposed of.

2.3 Payment.—The quantity to be paid for under this item shall be the area in acres prescribed or designated by the Engineer, within the limits of the work, from which all encumbrances as herein provided shall have been satisfactorily removed. In the case of isolated trees the area to be paid for shall be that covered by the overhang of the branches. Should any growth occur between the time of clearing and the time of placing of embankment, the Contractor shall satisfactorily remove such growth, but payment shall be made once only for any given area, regardless of how many times it may be found necessary to go over such area to render its condition satisfactory at the time of use. The unit price stipulated for this item shall include the cost of clearing the area of all encumbrances as specified, of disposing of all materials, maintaining the cleared condition until embankment is placed or contract completed, and all expense incidental thereto.

Item 3

Removal of Buildings and Other Structures

3.1 Description.—Buildings or other structures encumbering the site of the work, including concrete or masonry foundation, and fences, shall be removed as directed, and the ground occupied by them or af-

fectured by their construction or removal shall be left in proper condition for the building thereon of embankments or for any other use for which it may be needed.

3.2 Disposal of Materials.—Materials obtained from the removal of structures, under this item, shall be the property of the District unless otherwise specified, and must be stored or removed a reasonable distance from the vicinity of the work, as directed.

3.3 Payment.—The lump sum price to be paid for this item shall include the cost of clearing the area designated of all encumbrances as specified, of disposing of all materials, and all expense incidental thereto.

Item 4

Soil Stripping and Grubbing

4.1 Description.—Soil stripping and grubbing shall include the excavation within the area to be covered by levee and dam embankments, of all top soil, peat, grass, weeds, muck, boulders, loose rock, perishable or otherwise objectionable matter and the removal of all stumps and of all roots 1 inch or more in diameter, to such depths as may be ordered. Where such material overlies material to be excavated, stripping and grubbing shall not be estimated for payment as a separate item, but the surface material shall be measured with the excavation directly underlying.

Soil stripping and grubbing will be required only in the preparation of foundations for embankments under Items 30, 31, 32, and 33.

No payment shall be made for the stripping and grubbing of borrow pits, but the cost of such stripping and grubbing shall be included as a part of the contract price for furnishing and placing the other material taken from the borrow pit.

4.2 Payment.—Measurement for payment under this item shall include the quantity of material in cubic yards, measured in excavation, actually removed from within the limits shown on the Drawings or prescribed by the Engineer. The price bid shall include the cost of all operations and materials incidental to the excavation and disposal of the materials excavated, except as hereinbefore provided under Section 0.63 of the Specifications entitled Materials Obtained from Construction.

Item 5

Wire Fences

5.1 Description.—Wire and barbed wire fences of the types shown on the Drawings and described herein shall be furnished and erected wherever ordered.

The Contractor shall furnish and set in the fences, wherever required, gates of approved design, similar to that shown on the Drawings, with hinges and fastenings complete.

5.2 Materials.—In general, posts shall be of sound, cedar, local tornillo, white pine, or other satisfactory wood, entirely stripped of bark or skin. They shall be reasonably straight and roughly roofed on top; and shall be set plumb and at the locations ordered. The lower part of each post, to a height which will be about 6 inches above the surface of the ground when set, shall be charred as directed. In general, posts shall be spaced about 16 feet apart except at corner posts or straining posts, at either side of gates, and at other places as required, where they shall be spaced about 8 feet apart as shown on the Drawings. Line posts shall be not less than 4 inches in diameter at any section, and shall be set into earth not less than 2 feet, or into rock not less than 1 foot. Straining and corner posts shall be not less than 8 inches in diameter at any section, and shall be set into earth not less than 3 feet, or into rock not less than 2 feet, unless otherwise ordered. Other types of posts of equivalent durability, strength and appearance may be submitted for approval as substitutes for the wooden posts specified.

At corner and straining posts, at gates, and at other places required, wooden top braces or struts and No. 9 gage galvanized iron wire guys shall be furnished and placed as shown on the Drawings or directed.

The fencing shall consist of painted barbed wire, galvanized barbed wire, fabricated galvanized steel wire fencing of the gage, size and kind shown on the Drawings. Wire gage numbers used refer to the U. S. Steel Wire Gage, and the gage specified is that of the wire before being galvanized.

5.3 Erection.—Post holes shall be excavated sufficiently large to admit the post properly, and leave room for setting. Where rock is encountered, the posts shall be set in holes excavated by blasting or other satisfactory method, or shall be secured by other methods permitted or directed. Refilling shall be of proper material and thoroughly tamped. The fencing shall be attached to the posts by means of galvanized staples, or by other approved means. During erection the fencing shall be subjected to suitable tension, and when completed,

shall be satisfactorily taut, true to line, and fully in conformity with the Drawings and with good practice.

5.4 Payment.—The quantity to be paid for under Item 5 shall be the number of linear feet of fence actually built in accordance with the Drawings or orders, as measured along the structure, but not including gates, the length of each of which shall be the distance between centers of gate posts. The unit price per lineal foot stipulated under this item shall include the cost of furnishing and erecting all posts, braces, wire guys and wire fencing, the cost of excavating and refilling post holes, of charring posts, and of hardware, and all expense incidental to completing the work in a satisfactory manner.

The cost of metal work required for gates, hinges and gate fastenings, and the installation, shall be paid for under Item 65, Miscellaneous Machinery and Metal Work, and Item 75, Installing Metal Work. Lumber required for gates, other than that required for gate posts, shall be paid for under Item 50 or 51, Timber and Lumber.

Item 6

Wire Fences, Moving and Alterations

6.1 Description.—Existing wire fences, including gates, shall be moved or altered as shown on the Drawings or as ordered. The intention is to reproduce on the new location a fence equal in all respects to the fence being changed, with such improvement as can be obtained without added cost.

6.2 Materials.—Second-hand wire and posts may be used to make up deficiencies provided the future life will equal that of the structure being changed.

6.3 Payment.—The quantity to be paid for under this item shall be the number of linear feet of fence, including gates, actually rebuilt, or altered, by order of the Engineer, as measured along the structure. The unit price per lineal foot stipulated under this item shall include the cost of taking down and hauling the old material, erecting all posts, braces, wire guys, wire fencing and gates, excavating and refilling post holes and of such new hardware as is needed, and all expense incidental to completing the work in a satisfactory manner. The District reserves the right to furnish new posts or wire to be used instead of the old, and in exchange therefor.

Item 7**Electric Pole Lines**

7.1 Description.—Pole lines for electric power, telephone, telegraph, signal or other purpose shall be constructed, altered, or relocated by the Contractor as shown on the Drawings or as ordered by the Engineer.

7.2 Materials and Workmanship.—All materials used under this item shall be of the quality and dimensions stipulated in the Contract, or equivalent to those existing in the adjacent parts of the line concerned. Second-hand material approved by the Engineer may be used on alterations and relocations. Workmanship shall be in accordance with customary good practice, consistent with that used on other parts of the line concerned and to standards being actually used by the company owning, or to own, the line.

7.3 Interference With Operation.—Nothing shall be done to interrupt service over an operating line and no change or connection shall be made except by written authority of the Engineer who will make necessary arrangements with the owner.

7.4 Payment.—Payment under this item shall be made for the total length of pole line actually constructed, altered or relocated to the satisfaction of the Engineer. The unit price under this item, in terms of lineal feet measured along the structure or a lump sum for each job as stipulated in the Agreement, shall include all material, transportation, labor for erecting, guying, connecting, and all expense incidental to completing the work in a satisfactory manner.

Items 8, 9, 10.**Excavation of Canals and Laterals**

8.1 Description.—These items shall include the excavation of

9.1 irrigation canals and laterals sufficiently large for machine

10.1 work, and the placing of the excavated material in the embankments as needed to complete the sections shown on the Drawings, or ordered. The materials excavated under these items which are suitable shall be used in construction of the embankments, but payment will be made only for the original removal.

This excavation shall be classified as described in Section 0.66 of the Specifications entitled Excavation—Classification.

Item 8 shall include such excavation as may be classified properly as Class 1—Earth.

Item 9 shall include such excavation as may be classified properly as Class 2—Mixed Excavation.

Item 10 shall include such excavation as may be classified properly as Class 3—Rock.

The excavation under these items is not divided into work above, and work below, mean low water level.

8.2 Excavation.—Canals and laterals shall be excavated to the

9.2 prescribed lines and grades and finished in a workmanlike

10.2 manner, consistent with the equipment permitted and used for doing the work. Rock bottoms and banks must show no points of rock projecting into the prescribed section below the proposed water level, but above the water line the rock will be allowed to stand at its steepest safe angle and no finishing will be required beyond the removal of rock masses that are loose and liable to fall.

Runways shall not be cut into canal or lateral slopes below the proposed water level.

8.3 Construction of Embankments.—All suitable material from

9.3 the excavation will be used as far as practicable to build

10.3 the adjacent embankments. To be suitable the material shall be free from a harmful amount of matter which is perishable or of a nature to cause unduly prolonged settlement. Embankments shall be constructed to conform to the lines and grades shown on the Drawings or prescribed by the Engineer, and such overfill, not to exceed 5 per cent, shall be placed as may be required by the Engineer to allow for settlement. Backfilling around culverts, bridge abutments, turnout or other structures shall be done in accordance with Item 37, Backfilling.

Embankments built with teams and scrapers or with dump wagons shall be made in layers not exceeding twelve inches in thickness and kept as level as practicable. The travel over the embankments during construction shall be so directed as to distribute the compacting effect to the best advantage. Any additional compacting required over that produced by ordinary travel in distributing the material will be ordered in writing and paid for as Extra Work under the provisions of Section 0.19 of the Specifications. Machinery approved by the Engineer will be allowed for excavating. Embankments built with such machinery shall be placed wet, rolled, or otherwise compacted so as to produce a quality of work equivalent, in the opinion of the Engineer, to embankments constructed by teams and scrapers, in accordance with these specifications. No embankments shall be made from frozen materials nor on frozen surfaces.

8.4 Preparation of Foundation.—The sites of all embankments

9.4 included under this item shall be cleared as specified under

10.4 Item 2; buildings and other structures shall be removed as specified under Item 3; and where so shown in the Contract, the ground stripped and grubbed as specified under Item 4. When, in the opinion of the Engineer, stumps, roots and soil have been sufficiently removed, and material has been uncovered that provides a suitable foundation for the purpose intended, the material so uncovered shall be scored in a direction parallel to the embankment with a plow making open furrows not less than eight inches deep at intervals of not more than three feet. No direct payment shall be made for roughening the foundation as provided above, the cost of such work being a part of the unit price covering this item, stipulated in the Agreement.

Springs encountered in the base of the embankment shall be satisfactorily controlled by plugging, draining or other approved methods. When advisable, springs shall be led away from the embankments, as directed. Approved excavation and materials for this purpose shall be paid for under the appropriate items.

8.5 Disposal of Surplus Material.—Surplus excavation and

9.5 waste material shall be used to widen embankments, to build

10.5 approaches to the sites of bridges over the canal or lateral, or shall be deposited in such places and in such manner as may be suitable.

No excavated material shall be wasted within thirty feet of the slope stakes of cuts, unless permitted by the Engineer. Material taken from excavations, suitable for concrete aggregate or other purposes, except embankments, shall be deposited at convenient points as may be designated by the Engineer, as provided in Section 0.63 of the Specifications, entitled Materials Obtained from Construction.

8.6 Readjusting Shapes of Section.—The canal and lateral sec-

9.6 tions are shown on the Drawings, but the undetermined

10.6 stability of the material that will form the banks, or amount of material needed for embankments, may make it desirable during the progress of the work to vary the slopes and dimensions dependent thereon. Increase or decrease of quantities excavated as a result of such changes shall be covered in the estimates and shall not otherwise affect the payments due to Contractor, unless it is found by the Engineer that the unit cost is thereby increased, in which case the Engineer will estimate, and include in the amount due the Contractor the amount of such increase.

8.7 Borrow Pits.—Wherever the material from the excavation

9.7 suitable for use is insufficient in quantity to form the nec-

10.7 essary embankments, the Engineer will designate where additional Class 1 material may be procured. Unless otherwise directed by the Engineer, a berm of at least 12 feet shall be left between the outside of the embankment and edge of the borrow pit, and a berm of at least 6 feet between the edge of the borrow pit and the right-of-way line, with provision for side slopes of $1\frac{1}{2}$ to 1 on the sides of the borrow pit. Unless the Engineer gives the Contractor specific written orders to excavate other than earth from borrow pits all material obtained from borrow pits will be paid for under Item 8 as Earth Excavation, regardless of its actual character.

8.8 Structures.—The Contractor will not be required to exca-

9.8 vate for the foundation of flumes, culverts, bridges, irriga-

10.8 tion turnouts, drops, chutes or other structures to be built by others. Suitable openings will be left by him in the embankments at points designated for the erection of structures and the Contractor will not be required to return and complete the embankment after he has finished the adjacent work, provided that whenever structures are completed before the adjacent sections of canal or lateral are finished, the Contractor shall complete the embankments over the structure and finish the canal or lateral section. All work under this paragraph shall be included in the unit prices bid for excavation under this item.

8.9 Payment.—Payment under these items shall be made in

9.9 accordance with Section 0.72 of the Specifications, entitled

10.9 Excavation—Payment.

Items 11, 12, 13.

Excavation of Drain Ditches and Stream Channels

11.1 Description.—These items shall include all excavation for

12.1 drain ditches, relocation and improvement of stream chan-

13.1 nels, and for stream control channels; classified as described in Section 69 of the Specifications, entitled Excavation—Classification. In general the excavation under these items is intended to be done with suitable machinery of a type approved by the Engineer.

Item 11 shall include such excavation as may be classified properly as Class 1—Earth.

Item 12 shall include such excavation as may be classified properly as Class 2—Mixed Excavation.

Item 13 shall include such excavation as may be classified properly as Class 3—Rock.

The excavation under these items is not divided into work above, and work below, mean low water level.

11.2 Readjusting Shapes of Section.—Cross-sections of the ex-

12.2 cavation are shown on the Drawings, but the undetermined

13.2 stability of the material that will form the slopes may make it necessary during the progress of the work to alter the slopes and dimensions dependent thereon. Increase or decrease of quantities excavated as a result of such alterations shall be covered in the estimate and shall not otherwise affect the payments due to the Contractor, unless it is found by the Engineer that the unit cost has been increased thereby, in which case the Engineer will estimate and include in the amount due the Contractor the amount of such increase.

11.3 Slopes.—The slopes of all excavations on which revetment

12.3 is not to be placed shall be finished to the prescribed lines

13.3 and grades with reasonable care and workmanship consistent with the equipment permitted and used.

Excavation shall not extend more than one foot outside of the neat lines. Projections not over six inches within the neat lines will be permitted provided they occur only above the water line and provided they do not in the aggregate exceed the over excavation. In general, the neat lines indicate the minimum excavation.

All slopes on which concrete revetment is to be placed, as shown on the Drawings, shall be finished by special means if necessary, to a plane that shall not extend below the subgrade of the revetment, nor more than six inches above it. Excavation to a plane above the prescribed limit will not be accepted. In case excavation is made to a plane below the prescribed limit, the Contractor under this item shall reimburse the District for the expense incurred in refilling with sand or gravel to such prescribed limit.

11.4 Disposal of Material.—In general, it will be required that

12.4 the maximum feasible portion of the excavated material be

13.4 placed on one side of the excavation as directed by the Engineer, and as shown on the Drawings. The spoil banks shall be partially leveled by dragging the peaks deposited with each move of the excavator with from three to five passes of the drag bucket. It is not the intention to secure a smooth topped bank, but only to improve

the skyline of the bank by making it generally level. The cost of this leveling shall be included in the unit price bid for excavation.

In cases where the materials obtained from excavation under these items are designated on the Drawings or in the Agreement for use in the construction of levees, such levees shall be constructed under and in accordance with Item 31 of the Specifications, entitled Embankment for Levees (Placing Only).

Railroad embankments constructed from materials obtained from excavation under these items shall be constructed in accordance with the provisions of Item 35 of the Specifications, entitled Embankment, Miscellaneous.

11.5 Partial Excavation.—Where the material in the drain con-

12.5 sists of fine sand or other material liable to slough or run,

13.5 it may not be possible to excavate the drain to full depth in one operation. In such event the Contractor, if ordered in writing by the Engineer, shall excavate in the first operation to partial depth and in subsequent operations to full depth, and an allowance will be made the Contractor for the cost of additional moving of machinery in both directions, as determined by the Engineer, plus 15 per cent for profit, superintendence and general expense, but no rental on the machinery will be included.

11.6 Provision for Maintenance.—The sufficiency of depth of

12.6 excavation to the neat bottom line shown in the Drawings

13.6 or as ordered by the Engineer shall be tested from day to day by measurement at a point from 1800 to 2200 feet back of the machine, it being left to the judgment of the Contractor to excavate to extra depth to provide for natural filling in of the bottom. The Contractor shall remove all material thus measured above the neat bottom line before the work will be accepted, and no additional payment will be made either for the excavation of the extra depth or for such subsequent cleaning as may be required, such work being included in the contract price.

11.7 Responsibility for Damages to Excavation.—The Contrac-

12.7 tor's liability to repair damages caused by flood waters,

13.7 waste irrigation water, natural sloughing of slopes or filling of bottom of drains due to growth of vegetation and deposit of silt, is hereby limited to a distance of 2000 feet back of the point to which excavation is completed, as determined by the Engineer. Such determination shall be made at approximately regular intervals of one month as described in the previous paragraph, Provision for Maintenance, and such other inspection of slopes and spoil banks as the En-

gineer may consider necessary, but in no case shall the ditch be considered completed to a point within 2000 feet of the machine. The Engineer shall specify with each progress estimate the point to which the excavation at the corresponding date is found to be completed. The limitation of liability as provided in this paragraph does not operate as a final acceptance of any portion of the work, and it is expressly provided that in all respects not herein provided the Contractor's liability remains unchanged, and the Contractor shall protect the excavation at his own expense and repair all damages occurring in the length of excavation specified above.

11.8 Structures.—The Contractor will not be required to exca-

12.8 vate for the foundation of bridges, flumes or other per-

13.8 manent appurtenant structures to be built by others but suitable openings for the erection of such structures will be left by him at his own expense in the spoil banks at points designated, also at all existing crossings with roads and irrigation ditches unless otherwise ordered by the Engineer.

The Contractor must construct at his own expense all temporary structures necessary to protect the finished excavation or the excavator against surface water encountered in sloughs or lakes which the drains may cut. The District may require the Contractor to place pipe, backfill culverts or otherwise assist in building appurtenant structures. Such assistance shall be ordered in writing by the Engineer, and when so ordered shall be paid for as Extra Work in accordance with Section 19 of the Specifications.

11.9 Payment.—Payment for these items will be made in accord-

12.9 ance with Section 72 of the Specifications, entitled Excava-

13.9 tion—Payment, except that in cases of excavation where it is not practicable to measure the material in excavation, the quantities may be determined from spoil banks or embankments in which the material has been placed, making deduction of 5 per cent for expansion of the excavated material.

No payment additional to that stipulated for excavation shall be made under these items; but additional payment shall be made, if so stipulated, for suitably consolidating and trimming levees or other embankments constructed from such materials, as provided in Items 31 and 35.

Items 14, 15, 16.**Excavation for Irrigation Ditches and Minor Drainage**

14.1 Description.—These items shall include all excavation for

15.1 farm laterals and minor surface drainage, for drainage pro-

16.1 tection of roadbed and canals in cuts, where payment is not otherwise provided for, for draining berms and low sections of land adjacent to embankments, for disposing of springs in embankment foundations, for alterations to existing irrigating and drainage excavations, and for other similar purposes; classified as described in Section 0.69 of the Specifications, entitled Excavation—Classification.

Item 12 shall include all such excavation as may be classified properly as Class 1—Earth.

Item 13 shall include all such excavation as may be classified properly as Class 2—Mixed Excavation.

Item 14 shall include all such excavation as may be classified properly as Class 3—Rock.

The excavation under these items is not divided into work above, and work below, mean low water level.

14.2 Payment.—Payment for these items shall be made in ac-

15.2 cordance with Section 0.72 of the Specifications, entitled

16.2 Excavation—Payment.

Items 17, 18, 19, 17a, 18a, and 19a.**Excavation for Structures**

17.1 Description.—These items shall include all excavation for

18.1 structures on irrigation and drainage system, cut-off

19.1 trenches, spillways, conduits, retaining walls, other con-

17a.1 crete and masonry structures, buildings, bridges, and mis-

18a.1 cellaneous; also for pipe trenches, bridge piers and abut-

19a.1 ments unless classified and included under Items 23, 24, and 25.

The excavation will be classified in accordance with Section 0.69 of the Specifications, entitled Excavation—Classification.

Item 17 shall include such excavation as may be classified properly as Class 1—Earth.

Item 18 shall include such excavation as may be classified properly as Class 2—Mixed Excavation.

Item 19 shall include such excavation as may be classified properly as Class 3—Rock.

As provided in Section 0.72 of the Specifications, entitled Excavation—Payment, excavation above mean low water level is designated by Items 17, 18, and 19; and excavation below mean low water level is designated by Items 17a, 18a, and 19a, on the basis of the classification given above.

17.2 Sheet piling and Bracing.—Satisfactory sheet piling and bracing

18.2 shall be used, unless omitted by written permission of the

19.2 Engineer, to hold the sides of the excavation and to pre-

17a.2 vent damage from seepage in the cut. All sheet piling and

18a.2 bracing shall be removed as the backfill is placed, unless

19a.2 otherwise ordered or permitted in writing by the Engineer.

The excavation shall at all times be kept satisfactorily unwatered in accordance with Section 0.59 of the Specifications, entitled Pumps and Drains, except that after the excavation is completed and while concrete is being laid the unwatering of excavation shall be considered as part of the work required under the Concrete item involved.

17.3 Maintenance During Construction.—It is expected that the

18.3 excavations shall be protected by sheet piling, or the use of

19.3 flat slopes in lieu thereof, and that no re-excavation will

17a.3 be required. Should the protection prove inadequate and

18a.3 caving or sliding occur before the purpose of the exca-

19a.3 vation has been served, allowing a reasonably sufficient time for construction of the structure, then the Contractor shall re-excavate as directed, but in case the structure is the work of another contractor, he shall be paid the contract price per cubic yard for material so removed.

17.4 Payment.—Payment for these items shall be made in ac-

18.4 cordance with Section 0.72 of the Specifications, entitled

19.4 Excavation—Payment. Except in excavation for circu-

17a.4 lar pipes, measurement for payment shall be made, unless

18a.4 otherwise prescribed, to vertical planes bounding the neat

19a.4 lines of the base of the structure. Excavation for circular

pipes shall be measured to vertical planes to a width 2 feet greater than the outside diameter of the pipe and to the plane of the lowest part of the pipe exclusive of the bells or other projections. Where water-tightness in the backfill is an essential, excavation shall be made and measured for payment to the lines shown in the Drawings or prescribed by the Engineer. No separate payment shall be made for materials or labor employed in the placing or removal of sheeting and bracing, the cost of such work being considered as having been included in the unit price bid for excavation.

Items 20, 21, and 22.

Excavation and Embankment for Railroads, Streets and Highways

20.1 Description.—These items shall include the excavation of

21.1 material from railroad, street and highway cuts, from bor-

22.1 row pits, and from other points as required for railroad, street, or highway construction or alteration, not including bridge piers and abutments, nor drainage and other structures; the placing of such material in the embankments as directed; and the excavation and removal of material as is unsuitable for such embankment foundations. The materials excavated under these items which are suitable shall be used in the construction to the extent required, but payment will be made only for the original removal.

Embankments under these items may be constructed by the methods commonly employed in railroad and highway construction, in which the material may be deposited in dry condition. The embankments shall be so compacted that all shrinkage and settlement will be provided for by an overfill not exceeding 10 per cent; and such overfill shall be placed by the Contractor as required by the Engineer.

This excavation shall be classified in accordance with Section 0.69 of the Specifications, entitled Excavation—Classification.

Item 20 shall include all such excavation as may be classified properly as Class 1—Earth.

Item 21 shall include all such excavation as may be classified properly as Class 2—Mixed Excavation.

Item 22 shall include all such excavation that may be classified properly as Class 3—Rock.

The excavation under these items is not divided into work above, and work below, mean low water level.

20.2 Disposal of Material.—All suitable material from the ex-

21.2 cavation shall be used as far as practicable to build em-

22.2 bankments and to make refills in excavation. Surplus excavation and waste material shall be used to widen embankments, or shall be deposited in such places and in such manner as may be suitable.

No excavated material shall be wasted within thirty feet of the slope stakes of cuts, unless permitted by the Engineer, who shall usually require surplus material to be wasted below subgrade. Material taken from excavation, suitable for the construction of riprap, slope paving, and other works, shall be deposited at convenient points as may be designated by the Engineer, as provided in Section 0.63 of the Specifications, entitled Materials Obtained from Construction.

20.3 Completion of Excavation.—Excavation shall be taken out

21.3 to the cross-section slopes, and no projection inside such

22.3 slopes will be allowed. In all excavations for roadbed or roadway, side ditches shall be formed as directed by the Engineer, and such ditches shall be left in a neat condition, clear of obstructions, and shall be extended beyond ends of cuts a sufficient distance to insure proper drainage and to prevent damage to adjacent works.

In all rock excavation for railroad cuts the bottom shall be taken out, and measured for payment, to a depth of one foot below subgrade and refilled to subgrade with suitable material, less the area to be occupied by side ditches; the material so deposited to be paid for as provided in Item 35—Embankment, Miscellaneous.

20.4 Borrow Pits.—Wherever the material from the excavation

21.4 suitable for use is insufficient in quantity to form the nec-

22.4 essary embankments and refills, the Engineer will designate where additional Class 1 material may be procured. Unless otherwise directed by the Engineer, a berm of at least 12 feet shall be left between the outside of the embankment and the edge of the borrow pit, and a berm of at least 6 feet between the edge of the borrow pit and the right-of-way line, with provision for side slopes of $1\frac{1}{2}$ to 1 on the sides of the borrow pit. Unless the Engineer gives the Contractor specific written orders to excavate other than earth from borrow pits all material obtained from borrow pits will be paid for under Item 20 as Earth Excavation, regardless of its actual character.

20.5 Construction of Embankments and Refills.—The materials

21.5 used in railroad, street and highway embankments and re-

22.5 fills shall be free from all matter which is perishable or of a nature to cause unduly prolonged settlement. Embankments shall be constructed to conform to the lines and grades shown on the Drawings or prescribed by the Engineer, and such overfill, not to exceed 10

per cent, shall be placed as may be required by the Engineer to allow for settlement. Backfilling around culverts, bridge abutments or other structures shall be thoroughly compacted by puddling, tamping or other approved methods as directed.

20.6 Maintenance During Construction.—The Contractor shall

21.6 keep the roadbeds constructed under this Contract in good

22.6 condition, during the life of the Contract. When so ordered, he shall fill any depressions caused by settlement or by wear and tear due to use, and he shall be paid therefor at the unit prices stipulated for the respective items entering into such repairs.

20.7 Readjusting Grades.—Attention is called to the uncertainty

21.7 of ledge rock elevations, which, owing to the nature of the

22.7 work to be done, cannot be determined in advance. In order to avoid shallow rock excavation, or to obtain sufficient suitable materials for embankments and refills, or for any other purposes, the grades shown on the Drawings may be changed or modified at any time by the Engineer, to obtain the desired results.

20.8 Payment.—Payment under these items shall be made in ac-

21.8 cordance with Section 0.72 of the Specifications, entitled

22.8 Excavation—Payment; except as provided in Section 0.63 of the Specifications, entitled Materials Obtained from Construction.

Items 23, 24, 25, 23a, 24a, 25a.

Excavation for Pipe and Structures in River Bed

(By well-point drainage method)

23.1 Description.—These items shall include excavations for

24.1 siphon pipes, bridge piers and abutments, and other struc-

25.1 tures, principally in the bed of the Rio Grande, utilizing

23a.1 a well-point method for dewatering or predraining the

24a.1 surrounding ground.

25a.1 The excavation will be classified in accordance with Section 0.69 of the Specifications, entitled Excavation—Classification.

Item 23 shall include such excavation as may be classified properly as Class 1—Earth.

Item 24 shall include such excavation as may be classified properly as Class 2—Mixed Excavation.

Item 25 shall include such excavation as may be classified properly as Class 3—Rock.

As provided in Section 0.72 of the Specifications, entitled Excavation—Payment, excavation above mean low water is designated by Items 23, 24, and 25; and excavation below mean low water level is designated by corresponding Items 23a, 24a, and 25a, on the basis of the classification given above.

23.2 Method.—The essential feature of the well-point method
24.2 is that of draining a sufficient area and depth of wet
25.2 sandy ground to permit excavation by dry methods to the
23a.2 extent necessary for all or a suitable portion of a struc-
24a.2 ture, and to keep the area drained continuously until the
25a.2 under-water portion of the structure has been erected. Well points of suitable design are driven along a line enclosing the area to be excavated, and deeper than the lowest part of the proposed excavation. The enclosed area shall be liberally large. The system of headers and pipes connecting the wells shall be of suitable capacity and be so arranged and equipped with valves and fittings that changes may be made and additional well points added without disturbing continuous pumping. The pumping equipment shall be in duplicate, each unit of capacity sufficient to handle the entire work, and both kept in proper working order, connected and ready to operate at all times.

The excavation and surrounding ground shall at all times be kept satisfactorily unwatered in accordance with Section 0.59 of the Specifications, entitled Pumps and Drains, except that after the excavation is completed and while the structure is being built the unwatering of the excavation shall be considered as part of the work required under the structure involved.

23.3 Sheet piling and Bracing.—Satisfactory sheet piling and bracing
24.3 shall be used, unless omitted by written permission of the
25.3 Engineer, to hold the sides of the excavation until the
23a.3 structure for which the excavation was made has been
24a.3 completed.
25a.3.

23.4 Maintenance During Construction.—It is expected that the
24.4 excavations shall be protected by sheet piling, or the use of
25.4 flat slopes in lieu thereof, and that no re-excavation will

23a.4 be required. Should the protection prove inadequate and
24a.4 caving or sliding occur before the purpose of the excava-
25a.4 tion has been served, allowing a reasonably sufficient time
for construction of the structure, then the Contractor shall re-excavate
as directed, but in case the structure is the work of another contractor,
he shall be paid the contract price per cubic yard for material so re-
moved, otherwise he shall receive no additional payment.

23.5 **Payment.**—Payment for these items shall be made in ac-
24.5 cordance with Section 0.72 of the Specifications, entitled
25.5 Excavation—Payment. Except in excavation for circu-
23a.5 lar pipes, measurement for payment shall be made, unless
24a.5 otherwise prescribed, to vertical planes bounding the neat
25a.5 lines of the base of the structure. Excavation for circu-
lar pipes shall be measured to vertical planes to a width 2 feet greater
than the outside diameter of the pipe and to the plane of the lowest
part of the pipe exclusive of the bells or other projections. Where
water-tightness in the backfill is an essential, excavation shall be made
and measured for payment to the lines shown in the Drawings or pre-
scribed by the Engineer. No separate payment shall be made for ma-
terials or labor employed in the placing or removal of sheeting and
bracing, the cost of such work being considered as having been in-
cluded in the unit price bid for excavation.

Item 26

Extra Haul

26.1 **Description.**—Under this item shall be included the trans-
portation of excavated material beyond the limits indicated on the
Drawing or Drawings forming part of the Contract. All earthwork
is to be paid for at a flat unit price, such unit price to include trans-
portation within the limits indicated on the Drawings; and it is the
sole purpose of this item to provide for compensation to the Con-
tractor for unanticipated haul due to changes, subsequent to the exe-
cution of the Contract, in the locations of borrow pits or other exca-
vation or of the disposal of materials from such excavations. For
this purpose Contract Drawings covering work on which payment for
Extra Haul may be made shall show either the maximum haul, or the
location and quantities of each excavation and of the embankment or
spoil bank to be made from such excavation; and the length of haul
included in the unit price for excavation shall be the maximum haul
shown on the Drawings, or the distance, measured in a straight line,

from the center of mass of such excavation to the center of mass of such embankment or spoil bank, as designated in the Agreement or the Contract Drawing. In case of change, the distance shall be measured in a straight line between the centers of mass of the excavation and of the spoil bank or embankment, as either or both may have been relocated, and the distance for which Extra Haul will be paid shall be the increase in distance, if any, due to such change; measurements in all cases to be made in straight lines as provided above. Extra Haul shall be paid only for the materials actually involved in the change. The Contractor shall receive no compensation under this item except for increase in length of haul as provided above, and shall suffer no reduction in unit price because of any decrease in length of haul. Payment for Extra Haul shall be made only when shown on the Contract Drawing or stipulated in the Agreement.

26.2 Payment.—Payment under this item shall be made for Extra Haul as specified above, at the unit price stipulated in the Agreement. Such unit price shall be stated as the price per cubic yard per 100 feet.

Note.—There is no Item 27.

Item 28

Dry Rubble Paving

28.1 Description.—Dry Rubble Pavings shall consist of sound, durable, stones having established weathering qualities, imbedded in sound, durable, gravel or crushed rock, which shall be not larger than 2½ inches maximum size.

28.2 Method of Laying.—All paving shall be of the thickness and extent shown on the Drawings or ordered. At least one-third of the area of the paving shall be composed of stones having a depth equal to the thickness of the paving, and not less than two-thirds of the area shall be composed of stones having a depth of at least two-thirds the thickness of the paving. No stone having a depth less than one-half the thickness of the paving shall be used. Stones shall be placed by hand, close together, and thoroughly imbedded in the gravel or crushed rock foundation and stones of the various depths shall be well distributed. Strength being more essential than a neat surface, stones shall be laid on edge or on end rather than flatwise. All voids shall be filled with gravel or crushed rock, and the joints of the face of the paving filled with tightly-driven spalls. The depth of gravel or crushed rock bed shall be as shown on the Drawings.

28.3 Payment.—The quantity of Dry Rubble Paving to be paid for under this item shall be the number of cubic yards actually placed

within the limits prescribed. The gravel or crushed rock used in this connection shall be included for payment under this item. The price stipulated for this item shall include the cost of all work and materials, and all expenses incidental to preparing the foundation and constructing the paving.

Item 29

Riprap

29.1 Description.—Riprap of required thickness and composed of tough, durable stones of the sizes to be prescribed, shall be placed as designated in the Drawings or ordered. Stones placed on or in the slopes of embankments as a result of the grading of embankment material will not be classed as riprap. The Contractor will not be required to place riprap by hand, with the exception of such hand work as is necessary to make it conform to the specified lines. Only such of the harder stones as quarry to acceptable shapes and sizes, and the larger angular boulders, will be satisfactory for this work.

29.2 Payment.—The quantity of riprap to be paid for under this item shall be the volume in cubic yards actually placed within the prescribed limits. The unit price stipulated for this item shall include the cost of all material and work incidental to furnishing and placing the riprap, and leaving it in satisfactory condition.

Item 30

Embankment for Levees

(From Borrow)

30.1 Description.—This item shall include all embankments for levees shown on the Drawings or ordered by the Engineer, built from materials obtained from borrow pits.

30.2 Borrow Pits.—Borrow pits as provided in Section 0.60 of the Specifications shall be located as shown on the Drawings, or as designated by the Engineer. Unless otherwise directed, a berm of at least 20 feet shall be left between toe of the levee and edge of the borrow pit, and a berm of at least 6 feet between the edge of the borrow pit and the right-of-way line, with provision for side slopes of $1\frac{1}{2}$ to 1 on the sides of the borrow pit.

30.3 Materials and Workmanship.—The material shall be free from a harmful amount of matter which is perishable or of a nature to cause unduly prolonged settlement. Levees shall be constructed to conform to the lines and grades shown on the Drawings or prescribed by the Engineer, and such overfill, not exceeding 5 per cent, shall

wet, harrowed, or otherwise compacted so as to produce a quality of consolidation equivalent, in the opinion of the Engineer, to levees constructed by teams and scrapers, in accordance with the preceding paragraph. No levees shall be made from frozen materials nor on frozen surfaces.

The slopes shall be formed in a neat workmanlike manner in strict conformity with the slope stakes, but a separate dressing operation will not be required unless otherwise specifically provided in the Contract.

31.3 Preparation of Foundation.—The sites of all embankments included under this item shall be cleared as specified under Item 2; buildings and other structures shall be removed as specified under Item 3; and the ground stripped and grubbed as specified under Item 4. When, in the opinion of the Engineer, stumps, roots and soil have been sufficiently removed, and material has been uncovered that provides a suitable foundation for the purpose intended, the material so uncovered shall be scored in a direction parallel to the embankment with a plow making open furrows not less than eight inches deep at intervals of not more than three (3) feet. No direct payment shall be made for roughening the foundation as provided above, the cost of such work being a part of the unit price covering this item, stipulated in the Agreement.

Springs encountered in the base of the embankment shall be satisfactorily controlled by plugging, draining or other approved methods. When advisable, springs shall be led away from the embankments, as directed. Approved excavation and materials for this purpose shall be paid for under the appropriate items.

31.4 Structures.—Suitable openings will be left by the Contractor in the levees at points designated for the erection of structures and he will not be required to return and complete the levee after he has finished the adjacent levee, provided that whenever structures are complete before the adjacent sections of levee are finished, the Contractor shall complete the levee over the structure and the work shall be included in the unit prices bid for the levee under this item.

31.5 Payment.—The operations under this item shall be paid for on the basis of embankment, measured in place and the payment therefor, at the stipulated unit price, shall include the quantity in cubic yards deposited in accordance with the Drawings, Specifications, and instructions of the Engineer, and properly placed within the prescribed neat limits. No payment shall be made for embankment not actually placed, nor for overfill. The unit price paid shall include only roughening the foundation, placing, and compacting the material, and finishing as required. Payment for the excavation and transportation

of the materials is provided for under Item 11, or other appropriate item. Items 2, 3, and 4, cover clearing and stripping of the foundation.

Item 32

Earth Embankment for Dams

32.1 Description.—This item shall include embankments of earth, or parts of such embankments for dams.

32.2 Borrow Pits.—Borrow pits as provided in Section 0.60 of the Specifications shall be located as shown on the Drawings, or as designated by the Engineer. Unless otherwise directed a berm of at least 200 feet shall be left between toe of the dam and edge of the borrow pit, and a berm of at least six (6) feet between edge of the borrow pit and right of way line, with provision for side slopes of $1\frac{1}{2}$ to 1 on the sides of the borrow pit.

32.3 Materials and Workmanship.—The materials shall be free from a harmful amount of soluble salts or other matter which is perishable or of a nature to cause unduly prolonged settlement and shall be permanently stable. No material will be acceptable which has a tendency to slough, slide or wash when subjected to any condition which may reasonably be expected to occur. The surfaces shall contain sufficient binding material to be resistant against the effects of wind. The upstream portion of the embankment shall be composed of material containing sufficient clay or other finely divided particles to be highly impervious to water. The coarser portions of the material shall be used in the downstream third of the embankment. To obtain these results the Contractor shall use only carefully selected materials and where one borrow pit does not furnish suitable material, other sources shall be utilized, and if necessary to obtain satisfactory results, more than one class of material shall be deposited at the same time in the same or different portions of the embankment. The proposed source of material is specified in the Agreement or shown on the Drawings. Should a change in source of material be ordered which increases the Contractor's cost, such increase shall be estimated by the Engineer and with 15 per cent added a fixed allowance per cubic yard will be determined by him and added to each payment affected.

The dam shall be constructed to conform to the lines and grades shown on the Drawings, and such overfill, not exceeding one and one-half ($1\frac{1}{2}\%$) per cent, shall be placed to the extent required by the Engineer to allow for settlement. Backfilling as shown on the Drawings, or ordered, around the outlet works or other structures shall be done and paid for in accordance with Item 37, Backfilling.

The embankment shall be built in layers not exceeding eight (8) inches in thickness, before being compacted. Transverse surface slopes of not less than 10% shall be maintained at all times upward from the center line to the edge of the embankment and this edge shall be especially well compacted and kept accurately at the line of the prescribed slope.

Unless the earth is sufficiently moist when spread, each layer after it is compacted shall be wet immediately before the next layer is spread. Each layer shall be thoroughly worked and compacted by the continual use of a disc harrow drawn by tractor or at least three strong horses. If permitted, the compacting may be done by means of steam roller or traction engine of acceptable weight having grooved, banded or corrugated rolls. The distributing, wetting and compacting shall be done in such manner as to meet the approval of the Engineer.

The slopes shall be formed in a neat workmanlike manner and be kept in strict conformity with the slope stakes as the work progresses. The upstream face, where so specified, shall be dressed by hand to within four inches of the prescribed plane.

32.4 Preparation of Foundation.—The site of the embankment included under this item shall be cleared as specified under Item 2; buildings and other structures shall be removed as specified under Item 3; and the ground stripped and grubbed as specified under Item 4. When, in the opinion of the Engineer, stumps, roots and soil have been sufficiently removed, and material has been uncovered that provides a suitable foundation for the purpose intended, the material so uncovered shall be scored in a direction parallel to the embankment with a plow making open furrows not less than eight (8) inches deep at intervals of not more than three (3) feet. No direct payment shall be made for roughening the foundation as provided above, the cost of such work being a part of the unit price covering this item, stipulated in the Agreement.

Springs encountered in the base of the embankment shall be satisfactorily controlled by plugging, draining or other approved methods. When advisable, springs shall be led away from the embankments, as directed. Approved excavation and materials for this purpose shall be paid for under the appropriate items.

32.5 Payment.—The embankment under this item shall be measured in place and the payment therefor, at the stipulated unit price, shall include the quantity in cubic yards deposited in accordance with the Drawings, Specifications, and instructions of the Engineer, and properly placed within the prescribed neat limits. No payment shall be made for embankment not actually placed, nor for overfill. The unit price paid shall include roughening the foundation, exca-

vating, transporting, placing, sprinkling, and compacting the material, and finishing as required. Payment for clearing and stripping of the foundation is provided under Items 2, 3, and 4, and for backfilling under Item 37.

Item 33

Gravel Embankment for Dams

33.1 Description.—This item shall include embankments of gravel or parts of such embankments for dams.

33.2 Borrow Pits.—Borrow pits as provided in Section 0.60 of the Specifications shall be located as shown on the Drawings, or as designated by the Engineer. Unless otherwise directed a berm of at least 200 feet shall be left between toe of the dam and edge of the borrow pit, and a berm of at least 6 feet between edge of the borrow pit and the right-of-way line, with provision for side slopes of $1\frac{1}{2}$ to 1 on the sides of the borrow pit.

33.3 Materials and Workmanship.—The material shall be free from a harmful amount of matter which is perishable or of a nature to cause unduly prolonged settlement. The dam shall be constructed to conform to the lines and grades shown on the Drawings, and such overfill, not exceeding $1\frac{1}{2}$ per cent, shall be placed to the extent required by the Engineer to allow for settlement. Backfilling as shown on the Drawings, or ordered, around the outlet works or other structures shall be done and paid for in accordance with Item 37, Backfilling.

The embankment shall be made in layers not exceeding eight (8) inches in thickness, before being rolled, and kept reasonably level. Compacting shall be accomplished by the very liberal use of water, so applied as to transport each portion of the gravel at least a few inches, and rolling as required. No part of the embankment shall be made from frozen materials nor on frozen surfaces.

The downstream slopes shall be formed in a neat workmanlike manner in strict conformity with the slope stakes, but a separate dressing operation will not be required. The upstream face, where so specified, shall be dressed by hand to within 4 inches of the prescribed plane.

33.4 Preparation of Foundation.—The site of the embankment included under this item shall be cleared as specified under Item 2; buildings and other structures shall be removed as specified under Item 3; and the ground stripped and grubbed as specified under Item 4.

Springs encountered in the base of the embankment shall be sat-

isfactorily controlled by plugging, draining or other approved methods. When advisable, springs shall be led away from the embankments, as directed. Approved excavation and materials for this purpose shall be paid for under the appropriate items.

33.5 Payment.—The embankment under this item shall be measured in place and the payment therefor, at the stipulated unit price, shall include the quantity in cubic yards deposited in accordance with the Drawings, Specifications, and instructions of the Engineer, and properly placed within the prescribed neat limits. No payment shall be made for embankment not actually placed, nor for overfill. The unit price paid shall include excavating, transporting, placing, and compacting the material, and finishing as required. Payment for clearing and stripping of the foundation is provided under Items 2, 3, and 4, and for backfilling under Item 37.

Item 34

Rock Embankment for Dams

34.1 Description.—Under this item shall be included embankments of loose rock, or parts of such embankments for dams, built from rock taken from the cut-off trench or other rock excavations or from quarried rock.

34.2 Materials and Workmanship.—Rock used for this purpose shall be durable and permanently stable. It shall be free from admixtures of shale or clay in sufficient quantities to endanger stability of the embankment, or other matter which is perishable or of a nature to cause unduly prolonged settlement. The rock may be of all sizes and mixed indiscriminately. The embankment shall be constructed to conform to the lines and grades shown on the Drawings, and such overfill, not exceeding four per cent (4%), shall be placed to the extent required by the Engineer to allow for settlement.

The rock may be placed by any arrangement of dumping desired by the Contractor. The larger blocks of stone forming exterior surfaces shall be given a stable setting by barring and blocking with smaller stone and placed in strict conformity with the slope stakes as the work progresses. Care shall be exercised in dumping to prevent stone from rolling over the edge and being wasted outside the line of slope.

34.3 Preparation of Foundation.—The site of the embankment included under this item shall be cleared of trees, logs and other perishable material. No stripping nor grubbing will be required. Excavation if required will be paid for under appropriate items.

34.4 Payment.—The embankment under this item shall be meas-

ured in place and the payment therefor, at the stipulated unit price, shall include the quantity in cubic yards deposited in accordance with the Drawings, Specifications, and instructions of the Engineer, and properly placed within the prescribed neat limits. No payment shall be made for embankment not actually placed, nor for overfill. The unit price shall include clearing foundation of trees, logs and other perishable material, transporting, excavating, and placing; except as provided in Section 0.63 of the Specifications, entitled Materials Obtained from Construction, in which case no payment will be made additional to that paid under the Item for excavation.

Item 35

Embankment, Miscellaneous

35.1 Description.—This item shall include all embankments, as shown on the Drawings or as required by the Engineer, which are not otherwise provided for in the Specifications. It shall be used to include railroad embankments, embankments for streets and highways, and such other embankments as may be designated by the Engineer, in which the material may be deposited in dry condition and by the methods commonly employed in railroad and highway construction. Embankments of this class shall be so compacted that all shrinkage and settlement will be provided for by an overfill not exceeding 15 per cent; and such overfill shall be placed by the Contractor to the extent required by the Engineer. The slopes shall be formed in a neat workmanlike manner in strict conformity with the slope stakes, but a separate dressing operation will not be required, except where provided otherwise in the Contract.

35.2 Payment.—The embankment under this item shall be measured in place and the payment therefor, at the stipulated unit price, shall include the quantity in cubic yards deposited in accordance with the Drawings, Specifications, and instructions of the Engineer, and properly placed within the prescribed neat limits. No payment shall be made for embankment not actually placed, nor for overfill. The unit price paid shall include excavating, transporting, placing, and compacting the material, and finishing as required.

Item 37

Backfilling

37.1 Description.—This item shall include only such backfilling as is specified in the Agreement or shown on Drawings as a separate item, or as may be ordered as a separate item by the Engineer. It shall not include ordinary refilling of trenches and similar work.

Wherever backfilling is required, either in the Specifications, in the Drawings, or by the Engineer, it is evident that special care is necessary to accomplish the result desired, and the work shall be done carefully, and thoroughly, and strictly in accordance with instructions.

The term Backfilling shall be used to include filling around structures in cases where the methods specified for building embankments in which the structures are located are not sufficient, or practicable, to secure satisfactory results, and refilling of trenches. It is the intention to require backfilling around certain structures not only for refilling the excavation, but also, in some cases, for securing a compact, water-tight fill against the structures. It may be required in trenches, where settlement subsequent to the first filling is undesirable, or where water-tightness is a requirement. The material shall be selected and placed with care. It may be deposited through water if practicable; otherwise it shall be deposited in layers about 6 inches thick, each layer being sprinkled as required, and well tamped, or rolled, before the next layer is placed.

Trenches in which pipes or sewers are laid, shall be backfilled by tamping in 6-inch layers to a plane 1 foot above the top of the pipe or sewer, above which plane the backfilling shall be done by depositing the material through water if practicable.

37.2 Backfilling—Material to Be Used.—Materials used for Backfilling shall be selected from the materials from the excavations, or from borrow pits if the former are not sufficient or suitable. The materials shall be free from roots, brush, or any other perishable matter or material which will cause unduly prolonged settlement. Except as allowed by the Engineer frozen material shall not be used, nor shall backfilling be placed on or against a frozen surface. The maximum size, quantity and placing of large stones shall be as allowed by the Engineer.

37.3 Payment.—The backfilling to be paid for under this item shall include the quantity, in cubic yards, measured or estimated in place, between the outside neat lines of the structure and the prescribed lines for payment for excavation, or as shown on the Drawings or designated by the Engineer. The unit prices stipulated for backfilling under this item shall include the cost of selecting, placing, and compacting the material; of obtaining material from borrow pits, if necessary, and hauling it to the site; of furnishing and using water for sprinkling, wetting or puddling, of protecting pipes, conduits and other structures or property; and of all work or material incidental to placing the backfilling and leaving it in a satisfactory condition at the completion of the Contract.

Item 38**Slope Protection**

38.1 Description.—For protection against wash and other forms of disintegration, the surfaces of embankments, refills, exposed slopes of excavations, borrow pits and spoil banks, shall, where directed, be dressed with a covering of rock or gravel of the class and thickness prescribed.

38.2 Payment.—Payment under this item shall be made for the total number of cubic yards, measured in place, actually deposited and surfaced to the prescribed lines and grades. The unit price stipulated under this item shall include the cost of obtaining, transporting, placing and shaping the materials, and all expense incidental thereto. If permitted by the Engineer, suitable materials obtained from excavation and other construction operations of the District may be used by the Contractor for this work; in which case no charge shall be made against the Contractor for the use of such materials.

Items 39 and 39a.**Plain Concrete Structures**

39.1 Description.—These items shall include plain or slightly

39a.1 reinforced concrete structures, such as gravity section spillways and retaining walls, building foundations, bridge piers, and similar structures. The question as to whether a given structure, or part of structure, is included under these items or under the items relating to Reinforced Concrete Structures, shall be determined by the item references shown on the Drawings forming part of the Contract. Such concrete shall be placed between accurately made forms, and may be proportioned from about 1 of cement, 2 of sand, and 4 of coarse aggregate, to about 1 of cement, 3 of sand, and 6 of coarse aggregate, as the Engineer may direct. All concrete construction included under these items, and all operations incidental to such construction, shall conform to the requirements given in Sections 0.85 to 0.102, inclusive, of the Specifications, entitled Concrete.

As provided in Section 0.103 of the Specifications, entitled Concrete—Measurement for Payment, work above mean low water level is designated by Item 39; and work below mean low water level is designated by Item 39a.

Where approved by the Engineer, concrete may be built without forms against the sides of the excavation.

39.2 Payment.—Payment under these items shall be made in

39a.2 accordance with Sections 0.103 and 0.104 of the Speci-

fications, entitled Concrete—Measurement for Payment, and Concrete—Prices to Include. Payment for placing steel reinforcement or other metal work in concrete under these items shall be made separately in accordance with Item 46, Steel Reinforcement—Bending and Placing, and other appropriate items.

Items 40 and 40a.

Reinforced Concrete Structures

40.1 Description.—These items shall include reinforced con-

40a.1 crete structures of light section, such as counterfort spillways and retaining walls, culverts, conduits, sewers, gate chambers, canal structures, and similar structures. The question as to whether a given structure, or part of structure, is included under these items or under the items relating to Plain Concrete Structures shall be determined by the item references shown on the Drawings forming part of the Contract. Such concrete shall be placed between accurately made forms, and may be proportioned from about 1 of cement, 2 of sand, and 4 of coarse aggregate, to about 1 of cement, $2\frac{1}{2}$ of sand, and 5 of coarse aggregate, as the Engineer may direct. All concrete construction included under these items and all operations incidental to such construction, shall conform to the requirements given in Sections 0.85 to 0.102, inclusive, of the Specifications, entitled, Concrete.

As provided in Section 0.103 of the Specifications, entitled Concrete—Measurement for Payment, work above mean low water level is designated by Item 40; and work below mean low water level is designated by Item 40a.

Where approved by the Engineer, concrete may be built without forms against the sides of the excavation.

40.2 Payment.—Payment under these items shall be made in

40a.2 accordance with Section 0.103 and 0.104 of the Specifications, entitled Concrete—Measurement for Payment, and Concrete—Prices to Include. Payment for placing steel reinforcement or other metal work in concrete under these items shall be made in accordance with Item 46, Steel Reinforcement—Bending and Placing, and other appropriate items.

Items 41 and 41a.**Monolithic Concrete Slope Pavement**

41.1 Description.—Under these items shall be included the con-

41a.1 struction of monolithic concrete slope pavement, and the dressing and final preparation of the subgrade on which such pavement is to be placed. The Contractor shall dress all slopes to the true subgrade shown on the Drawings or required by the Engineer. Slopes shall be dressed in advance of concrete construction only as approved by the Engineer; the intention being to place the concrete immediately on all finish slopes in order to avoid deterioration of such slopes. As a result of operations under other items, the District will provide embankment slopes that are true to subgrade, and excavation slopes that are not below subgrade nor more than 6 inches above it.

Concrete may contain steel reinforcement, and may be proportioned from about 1 of cement, 2 of sand and 4 of coarse aggregate, to about 1 of cement, $2\frac{1}{2}$ of sand and 5 of coarse aggregate, as the Engineer may direct. Concrete shall be deposited in panels extending up and down the slope, but in pouring, concrete shall not be permitted to flow down the slope except through chutes.

A rigid requirement in placing this concrete will be the protection of the concrete mixture against damage from underground water, such as the washing out of cement; insuring concrete of the required quality and to the full dimensions prescribed. For this purpose the toe trench shall be kept unwatered, and, where seepage is present, the slope shall be covered with tar paper or other suitable material so as to insure a dry bed for the concrete. The Contractor will be required to maintain the slope to the prescribed lines in order to insure the full prescribed section of concrete. All construction joints shall be either horizontal or vertical, straight, normal to the surface, and well constructed, and shall have all exposed edges finished with a suitable edging tool. At frequent intervals sections of the finished concrete will be removed for rigid examination and test, as provided in Section 0.6 of the Specifications, entitled Inspection and Right of Access. In all other particulars the construction of monolithic concrete revetment, and all operations incidental to such construction, shall conform to the requirements of Sections 0.85 to 0.102, inclusive, of the Specifications, entitled Concrete.

As provided in Section 0.103 of the Specifications, entitled Concrete—Measurement for Payment, work above mean low water level is designated by Item 41; and work below mean low water level is designated by Item 41a.

41.2 Payment.—Payment for concrete under these items shall

41a.2 be made in accordance with Sections 0.103 and 0.104 of

the Specifications, entitled Concrete—Measurement for Payment, and Concrete—Prices to Include; such payment to include concrete placed below subgrade, where required. Payment for placing steel reinforcement or other metal work in concrete under these items shall be made in accordance with Item 46, Bending and Placing Steel Reinforcement, or other appropriate items.

Excavation for placing pavement below the bottom of the channel shall be paid for to the lines of such excavation as shown on the Drawings. Such excavation will be paid for under Item 17 or 17a, Excavation for Structures.

No separate payment shall be made for dressing and preparing excavation slopes nor for surfacing and making minor corrections in embankment slopes, the cost of such work being considered as having been included in the unit price bid for concrete.

Items 42 and 42a.

Precast Concrete Slope Pavement

42.1 Description.—Under these items shall be included the con-

42a.1 struction and placing of precast concrete slab revetment, the dressing and final preparation of the slopes on which such revetment is to be placed, and backfilling where required. Slopes shall be dressed in advance of concrete construction only as approved by the Engineer; the intention being to place the concrete slabs immediately on all finished slopes in order to avoid deterioration of such slopes. As a result of operations under other items, the District will provide embankment slopes that are true to subgrade, and excavation slopes that are not below subgrade nor more than 6 inches above such subgrade. Where trimming is necessary, the Contractor may, at his option, trim to subgrade and lay the slabs directly thereon, or he may trim to a plane below such subgrade; and in all cases where the slope is below subgrade he shall place the slabs on the true grade lines shown on the Drawings or required by the Engineer, by thorough backfilling with coarse sand or suitable gravel.

Concrete slabs shall be cast in approved molds (which shall not be loosened in less than 20 hours), in a place affording ample storage facilities, and unless otherwise directed, shall be aged without being further disturbed for not less than 28 days before being placed in the work. The concrete will contain reinforcing steel or other metal and may be proportioned from about 1 of cement, 2 of sand and 3 of coarse aggregate, to about 1 of cement, 2½ of sand and 4 of coarse aggregate, as the Engineer may direct. The maximum size of the coarse aggregate shall be such as will pass through a screen having 2½-inch round holes. Steam curing may be resorted to, provided the process

and appliances shall be satisfactory. The time required for curing by such steam process to give a strength of 28 days will be determined by the Engineer from actual tests. In all other particulars the construction of the slabs, and all operations incidental to such construction, shall conform to the requirements of Sections 0.85 to 0.102, inclusive, of the Specifications, entitled Concrete.

The slabs shall be assembled and secured in place in the manner shown in the Drawings.

As provided in Section 0.103 of the Specifications, entitled Concrete—Measurement for Payment, work above mean low water level is designated by Item 42; and work below mean low water level is designated by Item 42a.

42.2 Payment.—Except that the quantity to be paid for shall be

42a.2 measured in the blocks, payment for concrete under these items shall be made in accordance with Sections 0.103 and 0.104 of the Specifications, entitled Concrete—Measurement for Payment, and Concrete—Prices to Include. Payment for placing steel reinforcement or other metal work in concrete under these items shall be made in accordance with Item 46, Bending and Placing Steel Reinforcement, or other appropriate items.

Excavation for placing pavement below the bottom of the channel shall be paid for to the lines of such excavation as shown in the Drawings. Such excavation will be paid for under Item 17 or 17a, Excavation for Structures.

Wire rope, if shown on the Drawings as a part of the permanent installation, will be paid for under Item 65.

No separate payment shall be made for trimming excavation slopes, for backfilling, or for surfacing and making minor corrections in embankment slopes, the cost of such work being considered as having been included in the unit price bid for concrete.

Item 43

Stone Masonry

43.1 Description.—This item shall include the building of stone masonry as shown on the Drawings or as required by the Engineer. Unless otherwise shown on the Drawings, this masonry shall be of the class known as pitch-faced, range, squared-stone masonry, with backing of concrete, or of large roughly bedded stones, as the Contractor may elect. In case the courses are not of the same thickness, they shall decrease in thickness uniformly, from bottom to top.

Stones shall be hard and durable, free from seams or other imperfections, of approved size, quality, and shape, and in no case shall

have less bed than rise. They shall be clean and wet at the time of laying; they shall be well bonded, laid on natural beds, and solidly settled into place in a full bed of mortar. They shall not be laid in freezing weather except under special permission and directions from the Engineer.

Face joints shall be not more than 1 inch thick, and shall be finished flush, as the stones are laid. Mortar for the joints shall satisfy the requirements of Sections 0.105 of the Specifications, entitled Mortar. The maximum size of grains in fine aggregate shall be such as will pass a $\frac{1}{4}$ -inch mesh screen.

At least one-fifth of the face of the wall (and of the back if stones are used for backing) shall be headers; those in the face shall be so arranged that a header shall not be laid over a vertical joint, nor shall a vertical joint occur over a header. No header shall be less in length than three times the rise of the course. The whole structure shall be bonded together in accordance with good practice.

All concrete used for backing of stone masonry shall satisfy the requirements of Sections 0.85 to 0.102 of the Specifications, entitled Concrete. Such concrete, however, will not be measured for payment as concrete, but as stone masonry, as provided hereinafter.

Stone masonry shall be kept moist for at least 2 weeks after being laid, and shall be protected from freezing until thoroughly dried out.

43.2 Payment.—The quantity of stone masonry to be paid for under this item shall be the number of cubic yards, measured in place, laid in accordance with the Drawings, Specifications and instructions of the Engineer, including whatever concrete may be used for backing or interior. The unit price stipulated for this item shall include the cost of all labor and materials incidental to completing the construction to the satisfaction of the Engineer, except the cost of cement, reinforcing steel, and other metal work, as provided elsewhere in the Specifications and except the cost of materials obtained from construction as provided in Section 0.63, entitled Materials Obtained from Construction.

Item 44

Cement

44.1 Brands.—Cement, unless otherwise specified, shall be understood to mean Portland Cement, as defined in the Standard Specifications and Tests for Portland Cement, Serial Designation C 9-26, of the American Society for Testing Materials, and subsequent revisions thereof, or United States Government Master Specifications for Portland Cement. Before delivery of cement is made the brand

shall receive the approval of the Engineer. Preference shall be given to cements which, by their records, show uniformity of composition and tendency to maintain high strength of mortar with increased age.

44.2 Delivery and Storage.—Cement shall be delivered in cloth sacks or other strong, well-made packages, each plainly marked with the manufacturer's brand. The weight of cement contained in each such package shall be 94 pounds net, unless some other weight be adopted as a commercial standard during the life of this Contract. Packages in broken or damaged condition shall be rejected, or accepted only as fractional packages. All cement shall be dry, free from lumps, caking and water marks. Pending shipment and in transit cement shall be kept under proper seal.

44.3 Inspection, Tests and Requirements.—The cement will be subjected to thorough inspection and tests at the place of manufacture or on the work. It shall conform in all respects to the requirements of the Standard Specifications and Tests for Portland Cement, Serial Designation C 9-26 of the American Society for Testing Materials, and subsequent revisions thereof, or United States Government Master Specifications for Portland Cement. In addition to these requirements, standard 1 to 3 mortar briquets shall show an increase in tensile strength of not less than 20 per cent from the test at 7 days to the test at 28 days. Cement will not be accepted if tests indicate that it does not possess reasonably uniform composition. The Manufacturer shall notify the Engineer of manufacture a sufficient time in advance of shipment to allow for proper sampling. An agent of the Board shall have the right, at all times, of inspecting the raw materials and processes of manufacture at the cement works.

Cement will be accepted which has passed satisfactorily all the tests as required herein, including the 28-day tensile test. After any brand of cement shall have sufficiently proved its worth in actual practice upon the work, the Engineer may, should he deem it advisable, allow its use without waiting for the result of the 28-day test. Cement kept in storage may be subjected to retesting.

If the tests prove any cement unsatisfactory which has been delivered at the site of the work, such cement shall be at once plainly marked for identification, and promptly removed from the work and its vicinity, at the expense of the Manufacturer.

44.4 Payment.—Payment under this item shall be made for all cement that fulfills the requirements of these Specifications and is ordered and delivered in accordance with terms of the Agreement. The unit price stipulated shall include the entire cost of the cement and the cost of transporting and delivering it to the point of delivery designated in the Agreement. For purposes of payment, a barrel of ce-

ment shall be considered the equivalent of 376 pounds net of cement, a sack 94 pounds.

Item 45

Furnishing Steel Reinforcement

45.1 Description.—Steel reinforcement for concrete shall be reasonably free from mill scale, and shall strictly fulfill all the requirements and be subject to all the tests for the intermediate steel grade given in the Standard Specifications for Concrete Reinforcement Bars Rolled from Billets, of the Association of American Steel Manufacturers, as revised April 21, 1914. If required, bars shall be twisted or otherwise deformed, shall be of the sizes and weights shown in the Drawings or ordered, and shall be cut to the lengths ordered.

45.2 Payment.—Payment under this item shall be made for the number of pounds of reinforcing steel that fulfills the requirements of these Specifications and is ordered and delivered in accordance with the terms of the Agreement. The unit price stipulated shall include the cost of metal, cut to the required lengths, the royalty, if any, and the cost of transporting and delivering the reinforcing steel to the point of delivery designated in the Agreement. In determining quantities, except as the Engineer may require test weighing on scales, commercial unit weights shall be used.

Item 46

Bending and Placing Steel Reinforcement

46.1 Description.—Steel reinforcement will be purchased by the District, as provided in Item 45, Furnishing Steel Reinforcement, and will be furnished to the Contractor cut to the required lengths, and if so stipulated in the Agreement bent to the shapes required in the Drawings. It shall be secured in the positions required in an approved manner, so as to withstand, without displacement, the pouring and spading of concrete, until completely embedded, and shall fulfill in all respects the requirements of Section 0.102 of the Specifications, entitled Concrete—Placing Metal Work.

46.2 Protection of Steel.—Steel shall be effectively protected by the Contractor from damage of every kind, and if rust shall form, all loose rust scales shall be cleaned off with wire brushes or other implements. Mortar, oil, paint, grease or dirt, which shall adhere to the reinforcement, shall be removed prior to embedding the steel in the concrete. Ends of rods which are to be left projecting for a considerable time shall be painted with cement grout. Where reinforcing bars project from the Concrete, precautions shall be taken to prevent

the bars from being struck or jarred in such a way as to injure the bond between steel and concrete.

46.3 Payment.—The unit price paid under this item shall be the price per pound of the metal actually placed in the concrete. Such payment shall include the entire cost of storing, handling and placing the metal, and of all transportation subsequent to the delivery of the metal at the point of delivery designated in the Agreement.

Item 47

Drilling Foundations or Masonry

47.1 Description.—Under this item the Contractor shall, if ordered, drill holes in rock, concrete, or masonry for grouting, for inspection, for drainage, or for other purposes, at the places and to the depths to be designated by the Engineer. The diameter of such holes shall be not less than 2 inches, and larger if so specified.

When so specified in the Agreement the holes shall be drilled by means of diamond, shot, or other suitable rotating type of drill, capable of boring a smooth hole without disturbing the adjacent rock walls.

47.2 Payment.—The quantity to be paid for under this item shall be the actual number of linear feet drilled in accordance with orders. The unit price stipulated for this item shall include all expense necessary for drilling the holes as required.

Item 48

Grouting Foundations or Masonry

48.1 Description.—Under this item the Contractor shall place pipes for grouting operations, and shall force cement grout into such pipes or into holes drilled under Item 47, to the extent required to close any seams in the rock, concrete, or masonry that may be found to exist.

48.2 Pipes.—Under this item the Contractor shall, if ordered, set in the holes drilled under Item 47, and at such other places as may be directed, connecting pipes for grouting. Water-tight joints shall be made between the pipes and the side of holes drilled in rock or masonry, with an approved filler, and by an acceptable method.

The pipes shall be furnished at the site by the District, cut and assembled with standard fittings. They shall be made of standard weight merchant pipe not larger than 2½ inches in nominal diameter.

48.3 Grout.—Under this item the Contractor shall also, if or-

dered, force grout composed of cement and water, or of cement, sand and water, in proportions to be prescribed, through connecting pipes, into seams in any ledge rock, or any other places as directed. Sand for grout shall be clean, and shall be of such fineness that 100 per cent will pass a sieve having 64 openings per square inch, and 45 per cent will pass a sieve having 1,600 openings per square inch.

48.4 Mixing and Placing Grout.—The apparatus for mixing and placing grout shall be of an acceptable type, equal in efficiency to a machine having for its essential part an air-tight chamber in which the grout is effectively stirred, and from which it is forced into the work by air under any required pressure up to 80 pounds per square inch. Grouting shall be so conducted that the Engineer will be satisfied that the desired filling has taken place. Holes, Item 42, shall be made, if ordered, to test the efficacy of the filling. If it be discovered that any voids have not been thoroughly filled by the first application of grout, the process shall be repeated until satisfactory results are obtained.

48.5 Payment.—The quantity of grout to be paid for under this item shall be the actual number of cubic yards mixed in accordance with directions, measured in its liquid state before being forced into the work. The Contractor shall provide suitable means for convenient measuring. The unit price stipulated for this item shall include all labor, equipment and materials necessary for setting the pipes and doing the grouting, as directed, except that cement and connecting pipes will be furnished or paid for by the District.

Items 50 and 51

Timber and Lumber

50.1 Description.—These items shall include the furnishing or

51.1 erecting, or both, as designated in the Agreement, of timber and lumber of various sizes and for various purposes, when not covered by other provisions or items, used in the construction of pile and trestle bridges, decks for railroad bridges, floors for viaducts and highway bridges, bulkheads, guardrails, drains, flumes, platforms, grillages, gates, headworks and minor hydraulic structures, and material for bridge ties, sills, caps, stringers, and sway braces.

Item 50 shall include timber and lumber as above, untreated.

Item 51 shall include treated timber and lumber.

50.2 Materials.—Grading shown on the Drawings or in require-

51.2 ments of the Engineer shall be designated in accordance with the grading rules of the Western Pine Manufacturers' Associa-

tion, the West Coast Lumbermen's Association, and the National Hardwood Lumber Association. Unless noted specifically on the Drawings or Specifications, the Contractor will not be required to furnish any hardwood lumber under this item.

All dimension timber for bridge structures and appurtenances shall be rough, unsurfaced No. 1 Common Oregon Fir, unless otherwise shown on the Drawings, and shall be well seasoned, straight grained, with square edges and free from wind, shakes, holes, rotten knots, worm holes and other defects. Flooring, 2-inch by 4-inch, and 2-inch by 6-inch lumber upon which an asphalt surface is to be laid, shall consist of No. 1 Common Oregon Fir or Southern Pine and it may be furnished in random lengths unless otherwise stipulated.

Unless otherwise directed bridge ties shall be 8 inches by 8 inches by 10 feet, sized in thickness.

Specifications for treatment of timber and lumber shall be given on the Drawings or in the Agreement. A satisfactory application of preservative shall be used to protect all cuts made after the timber has been treated.

50.3 Erection and Workmanship.—All timber work shall be

51.3 constructed in a first class and workmanlike manner, in accordance with the details shown on the Drawings, and must be acceptable to the Engineer. Caps shall be drift bolted to piles. Bolt holes shall be bored with an auger the exact size of the bolts. Holes for draft bolts shall have a diameter one-sixteenth of an inch less than that of the bolts. All floor joists shall be sized at the ends, to give the flooring a uniform bearing. Flooring shall be laid with close joints and fastened as noted on the Drawings or ordered by the Engineer.

50.4 Payment.—Payments under these items shall be made at

51.4 the unit prices stipulated in the Agreement for (a) furnishing, or (b) erecting, or (a & b) both furnishing and erecting, or (c) for sheeting or sheet piling left in place, as the case may be. The quantities to be paid for under this item shall be the number of thousand feet board measure, computed from the nominal dimensions of the timber, actually furnished, or placed, or both, in accordance with the Drawings, Specifications and orders and not included in other items. Should any round timber be used it shall be estimated as square timber of the largest size, omitting fractions of an inch, which can be inscribed in the small end of the log. Any second-hand lumber which has been notched in previous use shall be estimated for payment as of the size of its smallest cross section.

No timber or lumber shall be paid for under this item which has not been specifically ordered, and this item shall not be interpreted to

include the lumber used for forms, molds, and centers for concrete or other masonry, for sheeting and bracing unless ordered to be left in place, for scaffolds or braces, for sluices or trestles, or for other temporary or construction purposes, the cost of which is to be included in the unit price stipulated for the work in connection with which it is used.

(a) The unit price stipulated for furnishing shall include the timber and lumber delivered in good condition at the point designated in the Agreement.

(b) The unit price stipulated for erection shall include handling and hauling from the point designated in the Agreement, the cost of all bolts, spikes and other fastenings, and of all labor and expense necessary and incidental to working, placing and securing the timber and lumber satisfactorily.

(c) Sheeting or sheet piling placed by the Contractor as an incidental to work under some other item or items of the Contract, and afterwards left in place by written order of the Engineer shall be paid for at the rate of \$15.00 per thousand feet board measure, unless a lower rate is named in the Agreement. This unit price shall include the cost of all bolts, spikes, nails and other materials, entering into the construction of such sheeting or sheet piling, and shall be in full settlement for all expense incidental thereto.

The unit prices paid under Item 50 shall relate to untreated timber and lumber.

The unit prices paid under Item 51 shall relate only to treated timber and lumber.

Item 52

Timber Piles

52.1 Description.—The Contractor shall furnish and drive piles of the quality herein specified in the positions shown in the Drawings or ordered. Such piles shall be of the lengths prescribed by the Engineer, and for the purpose of determining the lengths to be required, test piles of lengths to be ordered, shall be driven at the times, locations, and to the depths required by the Engineer.

52.2 Quality.—Piles shall be of red spruce, and shall be cut from growing trees when the sap is down; they shall be close grained and solid, free from cracks, shakes, large or unsound knots, decay or any other defects which would impair their strength or durability. Piles shall be cut above the ground swell of trees, shall be uniformly tapering, and a straight line from center of butt to center of tip shall lie wholly within the pile. Before driving, all piles shall be peeled.

52.3 Size and Length.—For lengths not exceeding 30 feet, piles shall have a diameter at tip of not less than 9 inches; for piles longer than 30 feet the minimum diameter shall be 8 inches. In all cases the diameter of the butt shall be at least 12 inches. Piles must be of such lengths as to insure sound wood, free from the effects of driving, when cut off at the required elevation. No splicing will be permitted.

52.4 Driving.—It is expected that piles will be driven to the depths shown on the Drawings, but modification may be made by the Engineer in accordance with the conditions developed. A steam hammer is preferred, but a drop hammer may be used, provided the weight of the hammer and height of fall are satisfactory. Where directed, a water jet shall be used to assist in driving. The small end shall be pointed, and the butt end cut off square, as directed. Care shall be taken not to damage the piles by excessive hammering. If directed, a suitable cap or follower can be used. All piles broken, split, or otherwise injured, and piles driven too low, out of position, or in any respect improperly driven shall be satisfactorily replaced at the Contractor's expense.

52.5 Cutting to Grade.—Piles shall be cut off at the required elevations. Where timber caps or grillages are to be used care shall be taken to insure a level cut, free from sloping or curved surfaces, to the end that a smooth, level bearing shall be provided at the exact elevation.

52.6 Payment.—The amount of piling to be included for payment under these items shall be the number of linear feet actually in place in accordance with the Drawings and directions, measured below the cut-off, and in addition, one-half of the quantity measured above the cut-off, no payment being made for piles that are damaged, broken, or otherwise unfit for use. Separate unit prices will be asked for piles 20 feet or less in length, and for piles more than 20 feet long. Test piles when ordered, shall be paid for under these items when driven to the satisfaction of the Engineer. Payment for test piles shall be made for the full length ordered by the Engineer, whether cut off or not. The unit price stipulated for these items shall include the entire cost of all labor and materials necessary for furnishing, placing, and cutting off the piles in a satisfactory manner, and all expense incidental thereto.

Item 53

Wood Sheet Piling

53.1 Description.—The Contractor shall furnish and drive wood sheet piling of the quality herein specified, in the positions shown in the Drawings or ordered. Such piles shall be of the lengths prescribed

by the Engineer, and for the purpose of determining the lengths to be required, test piles, of lengths to be prescribed, shall be driven at the times, locations, and to the depths required by the Engineer.

53.2 Materials.—Sheet piles shall be of red spruce or Oregon fir, of a grade equal to that specified under Item 50, Timber and Lumber, Untreated. Where 6-inch sheet piles are required, each pile shall consist of three 2-inch planks spiked or bolted together as shown on the Drawings. Other sheet piles shall be tongued and grooved, or splined and grooved, and of the dimensions shown on the Drawings or ordered, but shall not be less than 4 inches, nor more than 6 inches in thickness.

53.3 Driving.—It is expected that sheet piles will be driven to the depths shown on the Drawings, but modifications may be made by the Engineer in accordance with the conditions developed. Where directed, sheet piles shall be driven by the aid of a water jet and with a suitable cap or follower. All piles broken, split, or otherwise injured, and piles driven too low, out of position, or in any respect improperly driven, shall be satisfactorily replaced at the Contractor's expense. Piles shall be sawed off at the required elevations, and the pile head after sawing shall be sound and level.

53.4 Payment.—The amount of sheet piling to be paid for under this item shall be the number of thousand feet board measure of sheet piling actually in place in accordance with the Drawings and directions, measured below the cut-off, and in addition, one-half of the quantity measured above cut-off, no allowance being made for piles that are damaged, broken or otherwise unfit for use. Test piles, when ordered, shall be paid for under this item when driven to the satisfaction of the Engineer. Payment for test piles shall be made for the full length ordered by the Engineer, whether cut off or not. The unit price stipulated for this item shall include the entire cost of all labor and materials necessary for furnishing, placing and cutting off the piles in a satisfactory manner, and all expense incidental thereto.

Item 54

Steel Sheet Piling

54.1 Description.—Steel sheet piling of the lengths and thicknesses shown on the Drawings or ordered by the Engineer shall be furnished and driven by the Contractor. Test piles, of lengths to be prescribed, shall be driven at the times and locations and to the depths required by the Engineer.

54.2 Requirements.—Steel for sheet piling shall fulfill the requirements, and be subject to all tests for structural steel, given in the

Standard Specifications for Structural Steel for Bridges, Serial Designation A 7-24, of the American Society for Testing Materials, and subsequent revisions thereof. Steel sheet piles shall be of standard manufacture of integral rolled section and shall have a positive interlock so designed as to permit a change in direction of at least 15 degrees either way at the joint. Where shown on the Drawings, corners shall be formed by the insertion of a special member. Each pile shall have a hole near one end for handling.

54.3 Alternatives.—Where specified, piling of copper-bearing steel shall be furnished. In any case piling of copper-bearing steel, at an extra cost of \$3.00 per ton, may be furnished upon an equivalent basis with piling of non copper-bearing steel. For permanent installations where the piling is not to be redriven, used piles will be accepted at a unit price of twelve dollars (\$12.00) per ton less than for new piles, provided all are of the same kind and size, straight, uninjured, undeformed, and reasonably free from rust, and vice versa, new piles may be substituted by the Contractor, for any used piles specified in the Agreement, in case used piles in sufficient quantity are not available, and he shall be paid therefor at the rate of twelve dollars (\$12.00) per ton more than for used piles.

54.4 Tests.—Mill tests and inspection may be made under the supervision of the Engineer.

54.5 Driving.—Sheet piles shall be carefully driven to line and to the required depths. The methods and equipment shall be such as not to injure the piles unnecessarily. For this purpose suitable drive caps shall be used. Unless otherwise permitted, a steam hammer shall be employed for driving. Should the use of drop hammer be allowed, the Contractor shall employ only operators who are skilled in work of this kind, and the weight of hammer and height of fall at all times shall be subject to the approval of the Engineer. All piles which are damaged, or in any respect improperly driven shall be satisfactorily replaced at the Contractor's expense.

54.6 Payment.—The amount of steel sheet piling to be paid for under this item shall be the number of tons of 2000 pounds actually driven in accordance with the Drawings and Specifications. Test piles, when ordered, shall be paid for under this item, when driven to the satisfaction of the Engineer. Payment for test piles shall be made for the full length ordered. The unit price stipulated for this item shall include the entire cost of all labor and materials necessary for furnishing, storing, handling and driving the piles in a satisfactory manner, and all expense incidental thereto. If piles are required to be cut off, such work shall be paid for as Extra Work, under Section 0.19 of the Specifications. In determining quantities, except as the Engineer may require test weighing on scales, commercial unit weights

shall be used. Certain variations in the unit prices are stipulated in paragraph 53.3, Alternatives.

Item 57

Steel Tubes for Cylinder Piers

57.1 Description.—Under this item shall be included the furnishing, erecting and sinking of steel tubes for cylinder piers with the necessary excavation together with the furnishing and erecting of structural steel cross bracing between tubes as, and if, shown on the Drawings.

57.2 Materials and Workmanship.—Steel plates used in the fabrication, structural steel used for cross bracing, rivets and bolts shall be of qualities specified in Sections 0.110, 0.112, 0.114 of this Specification, and with the exception of bolts and rivets shall be given one shop coat of red lead paint as specified in Section 0.128. Shop and field riveting shall conform to Section 0.125.

Driving of the tubes will not be permitted; but weighting will be permitted provided such weighting is applied in such manner and degree that no damage is caused to the tubes or rivets. Excavation within the tubes shall be complete to their bottom edges. Cross bracing shall be fitted and erected without straining of parts.

57.3 Payment.—Payment under this item shall be made for the number of pounds of steel complete in place, as shown on the Drawings. The unit price per pound shall include the entire cost of materials, fabrication, painting, erecting, sinking, and excavation. Cleaning the interiors of the tubes and preparing them for concrete is not included under this item.

Item 58

Steel Pipe

58.1 Description.—This item shall include riveted steel pipe for the outlet pipes of the El Vado Dam, or other similar purpose.

58.2 Design.—The manufacturer's specifications and shop drawings, based upon information and drawings supplied by the District, shall receive the written approval of the Engineer before the pipe is fabricated or used on any part of the work.

58.3 Material and Workmanship.—All plates shall conform to Section 0.110 of these Specifications, rivets to Section 0.114, punching to Section 0.124, riveting to Section 0.125 and calking to Section 0.126. No rivet pass holes will be required unless specified, it being

preferred that riveting and calking be done from the inside of the pipe.

58.4 Painting.—After the pipe has been fabricated into three-course sections of 18 to 24 feet in length and passed by the inspector, it shall be thoroughly clean and tank dipped in an acceptable hot bituminous compound, remaining in the tank until the plate has reached the temperature of the bath. Before cooling the coating shall be wiped or scraped from the areas to come into contact at the field joints.

58.5 Marking.—The sections of the pipe, together with all fittings, shall be carefully paint marked for identification in the field. Two clear and distinguishable center punch witness marks shall be placed on the top outside of each length to identify corresponding rivet holes. The same rivet holes shall be further distinguishable by two paint marks.

58.6 Payment.—The pipe to be paid for under this item shall include the quantity in pounds of pipe made in accordance with the approved drawings and specifications, and delivered in good condition at the point of delivery designated in the Agreement. The unit prices stipulated under this item shall include the cost of all labor, supplies, and material and all other expenses incidental to furnishing the fabricated pipe, delivered in good condition, at the point designated in the Agreement.

Item 59

Balanced Needle Valves, Furnishing

59.1 Description.—Under this item shall be included the furnishing and delivery of balanced, needle or Johnson valves for the outlet works of the El Vado Dam, or other similar purpose.

59.2 Design.—General assembly drawings of the valves proposed, and specifications, shall be submitted with the bid. The manufacture shall not commence until the detail shop drawings have been approved by the Engineer. Extra copies, not exceeding four, of an assembly drawing, suitable for erection purposes, shall be furnished upon request of the Engineer.

Care shall be taken to avoid sharp corners or abrupt changes in cross section of metal by the use of ample fillets.

59.3 Materials and Construction.—Castings shall conform to Sections 0.116, 0.117 and 0.118 and 0.119 for iron, semi-steel, steel and bronze castings, as the case may be. Tolerances and machine work shall be in accordance with Section 0.132. Section 0.133 shall be complied with in the finish for bolts, studs and nuts.

59.4 Shop Assembly and Test.—Before shipment each valve shall be completely assembled in the shop for inspection, and to insure the correct fitting of all parts. Each valve shall then be subjected to a hydraulic test pressure of 225 pounds per square inch. Under this test pressure there shall be practically no leakage from the bolted flanged joints, and the leakage past the seat in the nozzle shall not exceed 25 gallons per minute. The parts of each valve shall be marked and match-marked for identification and to facilitate assembly in the field.

59.5 Painting.—After the satisfactory completion of the test, all unfinished surfaces on the outside of the valves shall be given one shop coat of first-class black machinery paint. All unfinished surfaces on the inside of the valves shall be coated with one coat of water-gas tar, followed by one coat of coal-gas tar, or, at the option of the Contractor, two coats of an equivalent high grade refined pitch tar paint, satisfactory to the Engineer, may be substituted for the water and coal-gas tar. All finished surfaces shall be covered with a heavy rust preventive compound.

59.6 Preparation for Shipment.—After the valves have been tested in accordance with the contract, painted, and accepted by the inspector, they shall be dismantled for shipment. All heavy parts shall be properly mounted on timber skids, and all small loose parts shall be boxed for shipment.

59.7 Payment.—Payment under this item will be the lump sum stipulated in the Agreement for each valve complete with its operating stand, piping and accessories. The lump sum shall include all expense, material and labor used in the manufacture, testing, painting, crating, loading, and delivering each valve in good condition at the point designated in the Agreement. Under the provisions for testing, test specimens, as required, shall be included.

Item 60

Butterfly Valves, Furnishing

60.1 Description.—Under this item shall be included the furnishing and delivery of butterfly valves for the outlet pipes of the El Vado Dam, or other similar purpose. These may be constructed for operation either by hand, hydraulic cylinder, water wheel, or electric motor, or any combination as specified or indicated on the Drawings.

60.2 Design.—General assembly drawings of the valves proposed, and specifications, shall be submitted with the bid. The manufacture shall not commence until the detail shop drawings have been approved by the Engineer. Extra copies, not exceeding four, of an

assembly drawing, suitable for erection purposes, shall be furnished upon request of the Engineer.

60.3 Materials and Construction.—Castings shall conform to Sections 0.116, 0.117, and 0.118 and 0.119 for iron, semi-steel, steel and bronze castings, as the case may be. Tolerances and machine work shall be in accordance with Section 0.132. Section 0.133 shall be complied with in the finish for bolts, studs and nuts.

60.4 Shop Assembly and Test.—Before shipment each valve shall be completely assembled in the shop for inspection, and to insure the correct fitting of all parts. Each valve shall then be subjected to an hydraulic test pressure of 225 pounds per square inch. Under this test pressure there shall be practically no leakage from the bolted flanged joints, and the leakage past the disc shall not exceed _____ gallons per minute. The parts of each valve shall be marked and match-marked for identification and to facilitate assembly in the field.

60.5 Painting.—After satisfactory completion of the test, all unfinished surfaces on the outside of the valves shall be given one shop coat of first-class black machinery paint. All unfinished surfaces on the inside of the valves shall be coated with one coat of water-gas tar, followed by one coat of coal-gas tar, or, at the option of the Contractor, two coats of an equivalent high grade refined pitch tar paint, satisfactory to the Engineer, may be substituted for the water and coal-gas tar. All finished surfaces shall be covered with a heavy rust preventive compound.

60.6 Preparation for Shipment.—After the valves have been tested in accordance with the contract, painted, and accepted by the inspector, they shall be dismantled for shipment. All heavy parts shall be properly mounted on timber skids, and all small loose parts shall be boxed for shipment.

60.7 Payment.—Payment under this item will be the lump sum stipulated in the Agreement for each valve complete with its operating mechanism and accessories. The lump sum shall include all expense, material and labor used in the manufacture, testing, painting, crating, loading and delivering each valve in good condition at the point designated in the Agreement.

Item 61**Radial Gates, Furnishing**

61.1 Description.—Under this item shall be included the furnishing of radial or Taintor gates of such sizes and types as may be required, fabricated as shown on the drawings. This item shall include all labor and material used in the complete mechanical assembling of, and all materials incorporated in, all detail parts including gates, bearings, timber sills, rubber side seals, hoisting cables, all fastenings, and other parts or appurtenances required in connection therewith, in accordance with the Drawings, and Specifications thereon. Where field connections are not specifically shown on the Drawings, the gates shall be fabricated in sections convenient for shipment by narrow gauge freight.

61.2 Materials.—All material used under this item shall conform to the Specifications, Sections 0.110 Steel Plates, 0.112 Structural Steel, 0.114 Bolts and Rivets, and 0.120 Steel Shafting. All structural members shall be carefully straightened in the shop by methods that will prevent injury before being laid off or worked on in any way.

61.3 Riveting.—The diameter and spacing of rivets and the thickness and dimensions of plates are generally shown on the Drawings. Details may be revised, with the approval of the Engineer, to meet the standard practice of the manufacturer. The pitch of rivets in the direction of stress shall never exceed 6 inches nor be less than three diameters of the rivet. At the ends of compression members the spacing shall not exceed four times the diameter of the rivets for a length equal to twice the width of the member. No rivet hole center shall be less than one and one-half ($1\frac{1}{2}$) diameters from the edge of the plate. Where two or more plates are used in contact, they shall be held together by rivets spaced not to exceed 10 inches in either direction. All riveting shall conform to the requirements of Section 0.125, entitled Riveting.

The minimum amount of field riveting shall be used, and all details shall be made so that the field rivets can be driven readily.

61.4 Punching and Subpunching.—The specifications in Section 0.124 shall be met.

61.5 Bevel Shearing and Calking.—All joints in the skin plates shall be bevel sheared and calked on the outside in accordance with Section 0.126, Calking.

61.6 Shop Assembly and Field Connections.—After the radial gates are fabricated in the shop in the sections in which they are to be shipped, each gate shall be completely and carefully assembled for reaming all field connection holes, inspection and to insure that the

dimensions shown on the drawings have been properly followed. When thus assembled, the over-all length of the gates, when at a temperature of 70° F., shall vary not more than one-fourth inch from the length shown on the Drawings. All parts shall be plainly marked so that the sections and parts of each gate can be identified in the field, and match marked to show the proper position of each section or part. The Contractor shall furnish rivets and bolts for making the field connections, including at least a 10 per cent excess of each size, and he shall take special care to insure that they are of proper dimensions for the various connections.

61.7 Shop Painting.—Before leaving the shop the surfaces of all structural steel, plates and castings, unless otherwise specified, shall be thoroughly cleaned and given one shop coat of water gas tar as specified in Section 0.127. Painting shall not be done until after the material has been inspected and accepted by the inspector and shall not obscure the marking or match marking. Wall plates, anchor bolts, pins and wrenches shall not be painted in the shop.

61.8 Payment.—The unit price paid under this item shall be the price per gate of given type and dimensions as scheduled in the Agreement. Such unit price shall include the entire cost, including delivery in good condition at the place and in the manner designated in the Agreement.

Item 62

Slide or Sluice Gates, Furnishing

62.1 Description.—Under this item shall be included the furnishing and delivery of cast iron, or steel, or cast iron and steel flap or check valves, slide or sluice gates, including operating mechanism, for headwork structures, sluice openings, drain outlets, and other similar purposes.

62.2 Design.—The principal features of each gate required will be covered by a suitable description, supplemental specifications, or drawings amplified with notes. Based upon this information the bidder will submit his general assembly and dimension drawing and a full description of each design. Cast iron seats and slides shall be machine faced, unless otherwise specified. In general, gate lifts shall have capacity to open the gate under maximum face pressure conditions with a 25 pound effort on the hand wheel or crank.

62.3 Materials and Construction.—Iron castings shall conform to Section 0.116. Tolerances and machine work shall be in accordance with Section 0.132, and Section 0.133 shall be complied with in the finish for bolts, studs and nuts. Threads on lifting stems may be

either lathe or die cut, at the option of the manufacturer, providing the resulting threads are accurate, smooth, and free from ragged edges. The anchor bolts shall be galvanized.

62.4 Painting.—Unfinished surfaces shall be given one shop coat of first-class black machinery paint. All finished surfaces shall not be painted but shall be coated with white lead and tallow.

62.5 Preparation for Shipment.—All bolts and small loose parts shall be boxed, and the detached parts of each gate shall be securely marked for identification, sufficiently legible to prevent confusion in the field delivery of many gates.

62.6 Payment.—Payment under this item will be the lump sum stipulated in the Agreement for each valve or gate complete with its operating stand, bracket, if any, for operating stand, stem, stem guides, stem stops or locks, anchor bolts, and other accessory parts. The lump sum shall include all expense, material and labor used in the manufacture, painting, crating, loading and delivering each gate in good condition at the point designated in the Agreement.

Item 63

Gate Hoists, Furnishing

63.1 Description.—Under this item shall be included the furnishing of gate hoists of such sizes and types as may be required for radial and slide gates constructed according to the designs, dimensions and of the materials specified on the Drawings, with all grease cups, keys, bolts and other accessories shown or required.

63.2 Materials and Construction.—All materials used under this item shall conform to the Specifications, Sections 0.116 Iron Castings, 0.113 Steel, 0.114 Bolts and Rivets, 0.120 Steel Shafting, 0.119 Bronze Castings, and 0.121 Babbitt. After babbitt for bearings has been poured and cooled, it shall be compressed by forcing through the bearing a taper arbor, or by some other suitable means, sufficient metal being left for reaming or boring to the proper size. Where tolerances are shown on the Drawings, they shall be carefully followed. Where tolerances are not given, the Contractor shall make allowance in machining for proper fits or connections, consideration being given to the condition under which the parts will be operated.

63.3 Shop Assembly and Operation.—Before shipment each hoist shall be completely assembled in the shop for inspection and to insure that the dimensions on the Drawings have been followed. Each hoist shall then be operated by means of its own motor, or by belting from a line shaft, for a sufficient length of time to insure that all parts move

freely and that the hoist is in a proper operating condition. The Contractor will be held responsible for correct and smooth operation, and will be required to make such changes at his own expense as may be necessary to accomplish this result. Each hoist shall be shop marked, and all detached parts properly labeled to facilitate assembly in the field.

63.4 Painting.—Before shipment the unfinished surfaces of all castings shall be thoroughly cleaned and given one coat of first class black machinery paint in accordance with Section 0.129. All finished surfaces shall be coated with a heavy rust-preventive compound. Identification marks must not be obliterated.

63.5 Payment.—The unit price paid under this item shall be the price of hoist or hoists, as required, per gate of given type and dimensions as scheduled in the Agreement. Such unit price shall include the entire cost of materials, labor, painting, assembling and testing, including all accessories and delivery in good condition at the place designated in the Agreement.

Item 65

Miscellaneous Machinery and Metal Work, Furnishing

65.1 Description.—Under this item the Contractor shall supply and deliver miscellaneous machinery and fabricated metal not included under other items. This item shall include iron fence gates with hinges and fastenings, iron handrails, doors, stairs and ladders, roof trusses, sash, small gate hoists, metal irrigation fixtures, gantry cranes, pumps, structural shapes or rail used for piles, woven wire fence, iron structures for jetties, steel wire and cable, cast iron frames with gratings and covers for manholes and catch basins, pipe and fittings for grouting and drainage operations and for weeper drains, wrought iron pipe and fittings, special cast iron pipe castings, steel floor plates and gratings, nails, staples, spikes, screws, bolts, anchor bolts, truss or tie rods, trash racks, and other similar material.

All wrought iron and steel furnished under this item shall be of quality and finish acceptable for the purpose contemplated and in accordance with Sections 0.110 Steel Plates, 0.112 Structural Steel, 0.113 Steel, and 0.114 Bolts and Rivets. All cast iron shall be strong, tough and even-grained, true to pattern, free from blow holes, porous defects, shrinkage or other cracks, and in every way acceptable and in accordance with Section 0.116, Iron Castings. Bronze and babbitt shall be as specified in Sections 0.119 and 0.121, respectively. Workmanship used in fabrication shall conform to the best practice and comply with the provisions of Sections 0.124, 0.125, 0.126, 0.132 and 0.133. Articles of machinery shall be first class in every particular

and meet the requirements and specifications set forth on the Drawings and in the Agreement.

65.2 Cleaning and Painting.—Unless otherwise specified, all castings shall be thoroughly snagged and cleaned and before rusting has begun, dipped in tar, or if permitted, painted with one coat of approved varnish paint. Other metal surfaces shall be satisfactorily cleaned and coated or painted as specified for the particular article. Metal work which is to be painted shall be given, when clean, a good shop coat of red lead or carbon paint, as ordered. No painting shall be done on damp or dirty surfaces.

65.3 Payment.—The quantity of machinery, cast iron, wrought iron and steel, or articles fabricated therefrom, to be paid for under this item shall be the number of units or number of pounds actually furnished in accordance with the orders and Drawings, and delivered in good condition at the point designated in the Agreement. The unit prices stipulated for articles in this item for each article or per pound, shall include the cost of furnishing, cleaning, painting, as directed, and delivering, and all materials, labor and expense incidental thereto. No cast iron, wrought iron or steel, which is not specifically ordered, shall be paid for under this item, and this item shall not be held to include metal used for covering or supporting forms, or for supporting or securing steel reinforcement; neither shall it be held to include spikes, bolts, and other metal, used in timber structures except when otherwise specified, nor any metal which by reasonable inference is necessary for doing work or furnishing material covered by other items.

Item 66

Corrugated or Plain Metal Pipe

66.1 Description.—Galvanized corrugated metal pipe, of the sizes specified, may be used for highway and road culverts, canal and lateral turnouts, drain outlets, underdrains, and other purposes, as shown on the Drawings or required by the Engineer. In some cases, where so specified, the pipe shall be plain, not corrugated.

66.2 Materials and Workmanship.—All pipe shall be of first quality, of such lengths as are indicated on the Drawings, and shall satisfy all the requirements of the Standard Specifications for Corrugated Metal Pipe Culverts, United States Department of Agriculture, Department Circular 331, and subsequent revisions thereof, except that plates conforming to Section 0.111 of these specifications will be acceptable.

Each pipe shall be thoroughly inspected upon delivery, and no bent, broken, or otherwise defective pipe shall be accepted; except that

the Engineer may pass minor defects which, in his opinion, do not impair the fitness of the pipe for the purpose intended.

66.3 Laying.—The pipe shall be laid true to the lines and grades, resting uniformly for its entire length on the bottom of the trench, and surrounded to the top of the pipe with compacted earth. The ends of adjacent pipes shall be fitted together accurately, and the joining bands shall be properly bolted and brought to a firm bearing on the pipes. The central portion of the pipe shall be set sufficiently above grade to allow for any probable settlement which might result in a water pocket.

The interior of the pipes shall be cleaned after being laid to remove dirt and other obstructions, and all pipes shall be left in a satisfactory and cleanly condition at the termination of the contract.

66.4 Payment.—The pipe to be paid for under this item shall include the quantity in linear feet, laying length, of the sizes and gages specified and ordered.

The unit prices stipulated under this item for furnishing shall include the cost of furnishing and transporting, and all other expenses incidental to delivering the pipe, joining bands, and bolts, in good condition at the point of delivery designated in the Agreement.

The unit prices stipulated under this item for laying shall include the cost of transporting the pipe to the site of the work from the point of supply designated in the Agreement, the cost of laying the pipe, making the joints, earth tamping and all other expense incidental to completing the work in a satisfactory manner, but shall not include the cost of pipe, or of excavating, or backfilling the trench above the top of the pipe.

Item 67

Metal Flume

67.1 Description.—This item shall include semi-circular galvanized metal flumes of the dimensions and types specified or shown on the Drawings.

67.2 Materials and Construction.—The Drawings will give the essential features of the design, and principal dimensions of the flumes required. Bidders will submit with their proposals, drawings and specifications showing the type of construction, including details, of the flume they propose to furnish, and a statement of the total weight of metal per foot of the completed flume.

The sheets from which the flume body is to be formed shall be galvanized and comply with Section 0.111 of these Specifications.

All carrier rods, compression bars, shoes, nuts, washers, hanger

plates and other parts, shall be galvanized with not less than one-half ounce of chemically pure zinc per square foot of surface or three-fourths ounce of commercially pure zinc. The coating shall withstand three immersions of one minute each in a copper sulphate solution, having a specific gravity of 1.186 at a temperature of 65 degrees Fahrenheit, without exposing the underlying metal, the sample to be thoroughly cleaned after each immersion.

67.3 Payment.—The flume to be paid for under this item shall include the quantity in linear feet, laying length, of the sizes and gages specified and ordered. The unit prices stipulated for furnishing shall include the cost of furnishing and transporting, and all other expenses incidental to delivering the flume complete, consisting of formed and beaded sheets, carrier rods, compression bars, shoes, nuts and washers, and other necessary metal supports and fastenings, in good condition at the point of delivery designated in the Agreement.

The unit prices stipulated for erection shall include the cost of transporting the material to the site of the work from the point of supply designated in the Agreement, the cost of placing, erecting and adjusting and all other expense incidental to completing and adjusting the work in a satisfactory manner, but shall not include the cost of flume materials nor of trestle or other support.

Item 68

Cast Iron Pipe, Furnishing and Laying

68.1 Description.—Cast iron pipe and specials to be furnished by the Contractor for sewer outlets, culverts, water or gas mains, and for other purposes as shown on the Drawings or ordered, shall satisfy all requirements of the Standard Specifications for Cast Iron Pipe and Special Castings, Serial Designation A 44-04, of the American Society for Testing Materials, and subsequent revisions thereof.

68.2 Laying.—Each length of pipe, unless otherwise permitted, shall be supported near each end by suitable wooden blocks and wedges of sound lumber. On grades, unless otherwise permitted, the pipe shall be laid with bells pointing up hill. The spigot ends of bell and spigot pipes shall be inserted into the bells to their full depths. Each joint space shall be of uniform width, and shall be packed with clean, sound packing yarn, tightly driven, so as to leave sufficient space for the joint. Unless other material is specified the joint shall be run with one pouring of the best quality of molten lead. After a lead joint has been run it shall be caulked by competent mechanics with at least three caulking tools of different widths, in such manner as to secure a watertight joint without overstraining the bells. Upon

completion the joints shall be tested with water at the pressure to which the pipe will be subjected in normal service. After the joints are finished and tested, selected earth shall be filled and tamped under and around the bottom one-third of the pipe so as to give it a firm, even bearing along its entire length. The collar for leading the joints shall be of a design approved by the Engineer.

68.3 Payment.—(Furnishing) The pipe to be paid for under this item shall include the quantity in tons of 2000 pounds delivered in good condition at the point of delivery designated in the Agreement. Pipe shall be weighed for payment as provided in the specifications of the American Society for Testing Materials referred to in Section 68.1. The unit price stipulated for furnishing cast iron pipe under this item shall include the cost of furnishing straight bell and spigot pipe only. Special castings and flanged pipe, if any are required, will be paid for under Item 65, Miscellaneous Machinery and Metal Work. These unit prices shall include the cost of making tests, coating, transporting, and all other expense incidental to delivering the pipe in good condition at the point of delivery designated in the Agreement.

(Laying) The pipe-laying to be paid for under this item shall include the length of pipe and specials, in linear feet, measured in the trench along the tops of the bells, actually laid in accordance with the requirements of the Drawings, Specifications and instructions of the Engineer. The unit prices per lineal foot stipulated for laying pipe of various diameters under this item shall include the cost of transporting the pipe from the point of delivery designated in the Agreement to the site of the work, the cost of cutting, handling and laying pipe and specials, of labor and material for joints, of testing and all other expense incidental to laying the pipe and leaving it in satisfactory condition. These unit prices shall not include the cost of pipe or of excavating or backfilling the trench, which will be paid for under the items provided therefor.

Item 71

Reinforced Concrete Pipe, Furnishing and Laying

71.1 Description.—Precast reinforced concrete pipe of the sizes specified may be used for sewers, culverts, drains, canal outlets, or other purposes as shown on the Drawings or as required by the Engineer. Plans and specifications for the manufacture of such pipe shall receive the written approval of the Engineer before being used on any part of the work. All pipe shall be properly cured for at least thirty days before being used. The sections shall be truly circular, have a uniform wall thickness throughout and shall be free from

porous or scaly spots or spalled edges, or other defect. The ends of each section shall be as strong as the body of the pipe. No cracked, broken or otherwise defective pipe shall be accepted; except that the Engineer may pass minor defects which, in his opinion, do not impair the fitness of the pipe for the purpose intended.

71.2 Laying.—The pipe shall be laid true to lines and grades, resting uniformly for its entire length upon the bottom of the trench, with joints carefully matched and completely filled with cement mortar. There shall be no shoulder or unevenness in the joints around the inside bottom half of the pipe. Each joint shall be thoroughly wet immediately before being filled with mortar. The interior of the pipe shall be carefully cleaned after laying to remove dirt, mortar and other obstructions, and the pipe shall be left in a satisfactory and cleanly condition at the termination of the Contract. Selected earth shall be filled and well tamped under and around the bottom one-third of the pipe after the joints have hardened.

71.3 Payment.—(Furnishing) The pipe to be paid for under this item shall include the quantity in linear feet of straight pipe, laying length, of the specified sizes, delivered in good condition at the point of delivery designated in the Agreement. The unit prices stipulated under this item for the various sizes shall include the cost of furnishing and transporting, and all other expenses incidental to delivering the pipe at the designated point.

(Laying) Payment for laying under this item shall include the number of linear feet, measured along the tops of the pipe after it has been laid in accordance with the Drawings and requirements. The unit prices for the various sizes stipulated for laying shall include the cost of transporting the pipe from the point of supply designated in the Agreement to the site of the work, the cost of storing, handling and laying the pipe, of making the joints, the tamped earth support, and all other material and expense incidental to completing the work in a satisfactory manner. The unit price shall not include the cost of pipe or of cement, or of excavating and backfilling the trench, which will be paid for under the items provided therefor.

Item 72

Vitrified Pipe, Furnishing and Laying

72.1 Description.—Vitrified hub and spigot pipe and fittings of various sizes from 4 inches up to 36 inches, as shown on the Drawings or ordered, may be used for sewers, drains, small road culverts, and other purposes as directed. It shall be vitrified, salt glazed, double strength, or standard, stoneware pipe of reasonably true cylindrical

form, well and thoroughly burned, without warps, cracks or other imperfections. Each piece shall be carefully inspected immediately upon delivery, and no cracked or broken or otherwise imperfect pipe shall be accepted; except that the Engineer may pass minor defects which in his opinion do not impair the fitness of the pipe for the purpose intended.

72.2 Laying.—The pipe shall be laid true to lines and grades, resting uniformly for its entire length upon the bottom of the trench with joints either wholly or partially filled with cement mortar as required. The spigot shall be truly centered in the hub and there shall be no shoulder or unevenness of any kind at the joints around the inside bottom half of the pipe. In sewers or in those portions of pipe drains which are laid with mortar joints, especial care shall be taken that the joint space be of uniform widths around the pipe, and where full mortar joints are required, jute or oakum gaskets soaked in cement grout shall be firmly caulked into the joints. The mortar shall be thoroughly worked into each joint, and a sufficient overfill made to hold the mortar in the joints firmly in place. The interior of the pipes shall be carefully cleaned after laying to remove dirt, mortar or other obstructions, and all pipes shall be left in a satisfactory and cleanly condition at the termination of this Contract.

72.3 Payment.—Payment for furnishing under this item shall include all pipe and specials delivered as stipulated in the Agreement. The unit prices shall be the price for each size per lineal foot of pipe, laying length, and the price per fitting of each kind and size. Such unit prices shall include the cost of furnishing and transporting, and all other expenses incidental to delivering the pipe and fittings in good condition at the point of delivery designated in the Agreement.

Payment for laying under this item shall include the number of linear feet, measured along the top of the pipe after it has been laid in accordance with the Drawings and requirements. The unit price stipulated for laying shall include the cost of transporting the pipe from the point of supply designated in the Agreement to the site of the work, the cost of laying the pipe and fittings and of making the joints, and all other expense incidental to completing the work in a satisfactory manner. The unit prices shall not include the cost of pipe or of cement, or of excavating and backfilling the trench, which will be paid for under the items provided therefor.

Item 75**Installing Metal Work**

75.1 Description.—Under this item the Contractor shall set in place, in complete working order, miscellaneous machinery and metal work as may be required, at the places shown in the Drawings, or as ordered, the installation of which is not otherwise provided. The item shall include the installation of balanced needle valves, butterfly valves, radial gates, slide or sluice gates, gate hoists, gantry cranes, trash racks, steel floor plates and gratings, anchor bolts, truss or tie rods, cast iron frames with gratings and covers for manholes and catch basins, steel pipe for conduits, metal irrigation fixtures, wrought iron pipe and fittings, handrails, doors, stairs, ladders, and sash of iron, roof trusses, permanent installations of pumps, pipe and fittings for drainage operations and for weeper drains, woven wire fence, iron structures for jetties, steel wire and cable, structural shapes or rail used for piles.

This item shall NOT include the installation of iron wire for fences, reinforcing steel, grouting pipes, nails, spikes and bolts, steel sheet piling, steel tubes for cylinder piers, corrugated or plain metal pipe, metal flume, cast iron pipe, rail and other track material used on railroad work, steel bridges, or other iron work, the installation of which is provided for in other items.

75.2 Precautions.—The Contractor shall exercise especial care to obtain proper alignment of the various working parts of gates, valves and machinery, to embed securely all anchor bolts, to make water-tight the joints between the flanges of wall frames and the concrete support, to insure that gate frames are not sprung out of shape and that gate seats and guides shall be set truly straight and parallel. Written instructions for the installation, supplied by the manufacturer or furnished by the Engineer, shall be followed strictly and the Contractor shall be held responsible for, and make good, any defect in case he shall fail so to do.

75.3 Painting.—After erection, unless otherwise specified, the Contractor shall give all machinery and metal work two coats of paint of the kind and quality specified. The paint shall be thoroughly and evenly applied under proper weather conditions. No such painting shall be done until after inspection, and machined surfaces shall not be painted unless so ordered, but shall be protected with a coat of heavy grease.

75.4 Payment.—The quantity to be paid for under this item shall be the weight in pounds of all machinery and metal work, including accessories, placed in accordance with the Drawings and Specifications and the instructions of the Engineer. The unit prices stipulated

for this item shall include the cost of handling and transporting from the point of supply designated in the Agreement, storing, placing, and where required painting, and all labor and materials incidental thereto, including protection during construction, so that the installations will be left in good operating condition at the close of the contract.

Item 76

Electric Lighting and Power Installations

76.1 Description.—Under this item shall be included electrical conduits and fittings, buried in concrete or exposed; fixtures, posts and brackets for lighting; generators with driving power, and motors, with auxiliary apparatus; signal and recording instruments; also wires and cables used as electrical conductors.

76.2 Material and Apparatus.—Contractors proposing to furnish electrical material and apparatus under this item shall submit drawings and specifications with the Proposal. The Contractor shall furnish such material and apparatus at the unit prices stipulated in the Agreement, and it shall conform to the Drawings and Specifications approved by the Engineer and attached to the Agreement. The unit prices paid therefor shall include the entire cost at the place of delivery stipulated in the Agreement.

76.3 Electrical Conduit and Fittings.—(Installation) The Contractor shall install all electrical conduits and fittings at the unit prices stipulated therefor in the Agreement. The price bid shall include the cost of unloading, storing, handling, cutting, fitting, bending, and placing the conduits and fittings in their correct position. Burrs and sharp corners on the end of each piece of conduit shall be removed with a taper reamer. At outlet boxes and fittings, lock nuts and bushings shall be used to protect the wires from abrasion. Provision shall be made for draining conduits as directed by the Engineer. Conduit runs in the open shall be installed substantially in a neat and workmanlike manner with adjoining runs truly parallel and with the terminals accurately located as shown on the Drawings. No installation of wires or cables is included.

76.4 Lighting Supports, and Apparatus.—(Installation) The Contractor shall install all fixtures, posts and brackets for lighting, install generators and motors, signal and recording instruments, and other electrical apparatus at the unit prices stipulated therefor in the Agreement. The price shall include the cost of unloading, storing, handling, placing and connecting, and all other costs incidental to a satisfactory and complete assembly ready for operation.

76.5 Wires and Cables.—(Installation) The Contractor shall

install all wires and cables at the unit prices stipulated in the Agreement. The price bid shall include the cost of unloading, storing, handling, placing and connecting the wires and cables in accordance with the best practice, complete ready for use.

76.6 Payment.—The unit prices paid under this item shall be those stipulated in the Schedule, in the Agreement.

Item 77

Alteration of Tracks

77.1 Description.—This work shall include shifting or throwing existing tracks, changing or moving turnouts, replacing light rail with heavier rail, replacing defective switch or other material, tie renewals, tie plating, re-spiking or re-bolting existing track; filling and raising existing track; gaging, lining and surfacing; trimming and lining ballast or other slopes; and otherwise putting such existing tracks in thoroughly good condition for service.

77.2 Payment.—Unless otherwise provided, payment under this item shall be made as provided in Section 0.19 of the Specifications, entitled Extra Work.

Item 78

Removal of Tracks

78.1 Description.—All tracks designated to be removed in connection with main line or yard reconstruction or alteration shall be taken up as ordered, in conformity with the plan of such reconstruction or alteration. The materials released by such removal shall be piled or stored at points designated by the Engineer, the different classes of material, as well as relay and scrap material, to be separated and separately piled by the Contractor, under the direction of the Engineer. No tracks shall be removed except by written authority of the Engineer, who will designate the time and order of such removals.

78.2 Payment.—Payment under this item shall include the cost of taking up all material, including ties, unless otherwise specified composing the tracks removed; of transporting, separating, and piling or storing such materials, as provided in Section 78.1 above; and of burning or otherwise removing all ties that are unfit for service. Unless otherwise agreed, the unit prices paid under this item shall be as follows:

For Rail, Rail Fastenings and other Track Fixtures—Price per gross ton.

For Complete Turnouts—Price each.

For Cross Ties—Price each.

For Switch Ties—Price per 1000 feet B. M.

Item 79

Track Laying and Surfacing

79.1 Description.—Under this item shall be included the construction of all tracks, turnouts and crossings, together with the installation of all track material, fixtures and appurtenances required in connection with such construction; all handling of materials incidental to such construction, such as the unloading of materials from railroad cars, and the loading, transportation and unloading of materials stored at designated storage yards or obtained from track removals and alterations; the distributing and applying of ballast; and the trimming and lining of ballast slopes.

79.2 Rail.—Rail may be distributed either from train end, as in main line track laying, or from sides of cars. If distributing from sides of cars, both ends of rails must be dropped simultaneously, care being used to avoid injury by dropping them on rocks, frozen ground, or other hard substances. Skids will invariably be used whenever unloading into piles. Rails shall be piled in accordance with drawing furnished by the Engineer. The Contractor will be responsible for all damage to rail in unloading or subsequent handling.

79.3 Rail Curving.—Rails of all weights shall be curved for laying on curves having a rate of 2 degrees or more. The method employed in curving rail must have the approval of the Engineer. The sledging of rails will not be permitted. Particular care shall be used to insure uniform curvature of a rail throughout its length, in accordance with the table of middle and quarter ordinates which will be furnished.

79.4 Rail Joints.—Angle bars shall be in proper position and nuts screwed up to a moderately tight fit and even bearing before joints are spiked. All joints must be slot spiked. At the time rail is laid two bolts will be placed in each angle bar, and tightened sufficiently to hold the rail in line. The remaining bolts will then be placed and tightened, with as little delay as possible. Nuts shall be tightened a second or third time within thirty days after track is laid. Any kinks or bends that may be in the rail, after laying, shall be taken out before bolts are tightened.

Where permitted by punching of angle bars, bolts will be staggered with nuts alternately inside and outside the rail. When nut

locks are to be used, they will be applied at the time of bolting the joints.

79.5 Rail-Expansion.—The proper allowance at each joint for expansion due to change in temperature must be made immediately after track is laid and surfaced, and shall be as follows:

100 Degrees F.	—nothing.
80 Degrees F.	—1-16 inch.
60 Degrees F.	—1-8 inch.
40 Degrees F.	—3-16 inch.
20 Degrees F.	—1-4 inch.
Zero Degrees F.	—5-16 inch.

The thermometer will be read in the shade.

Proper expansion will be secured by the use of shims, provided by the Contractor in accordance with the above specifications.

79.6 Rail Laying.—Rails will be laid to line and gage. On all tracks rail will be laid with broken joints, whether on tangents or curves. In maintaining broken joints on curves, no joints shall be nearer, in distance along the track, to a joint in the rail opposite, than one-third of the standard length of rail in such track. Short rails will be used on the inside of curves, whenever necessary to maintain the position of joints near the center of rails on the outside of curves. To insure perfect alignment at rail ends, the rails will be brought squarely together and the angle bars placed and carefully bolted before spiking.

79.7 Gaging, Spiking and Lining Track.—Gage on standard gage tangents will be 4 feet 8½ inches. Gage need not be widened for curvature on standard gage curves of 8 degrees and under. For curves of more than 8 degrees the gage shall be made to conform to the widths shown in the table which will be furnished. Extra width of gage on curves will be uniformly decreased on spiral curves, throughout their length to the tangent. Spiral curves will be spiked to gage at five different points within each rail length, and all track shall be accurately gaged when spiked. Where no rail braces or tie plates are provided, or where tie plates without shoulders are used, gage of track on curves will be maintained by double spiking outside of rails. With shoulder tie plates, gage on sharp curves will be maintained by double spiking inside of rails. The track gage used in this work will be subject to the approval of the Engineer.

Track shall be full spiked, with inside and outside spikes driven near the edges of the ties; ordinarily the spike will be driven about 2½ inches from the edge of the tie. Spikes shall be set one-half of their own width from edge of rail and driven vertically to a full bearing on the foot of the rail. The prevalent practice of driving sloping

spikes, or giving them a final lateral blow to close them against the rail will not be permitted. So far as possible the spikes will be driven in the best wood in the tie, which is usually at the outer edge, and they must not be redriven in old holes. Old holes in salvaged ties that may be used in track laying will be stopped with tie plugs.

All track will be lined with the track centers set by the Engineer. These will be set on tangents at the even 100 foot station points, on circular curves at intervals of 50 feet, and on spiral curves at such chord points as may be required. Track when lined shall closely conform to the line established.

79.8 Ties—Number and Spacing.—The number of ties per rail length will vary with the length of the rail, weight of rail, weight of wheel loads passing over the track, and the purpose such track is intended to serve. In main track 21 ties shall be used in a rail length of 33 feet, or 3360 ties in one mile of track. The clear space between cross ties in main line and other important tracks shall not be more than 12 inches, nor less than 10 inches, except at rail joints, where spacing will be governed by spike slots in the angle bars. In tracks of less importance the number of ties will be as shown on the Drawings, or as ordered by the Engineer. The spacing between ties at rail joints shall not exceed 10 inches. Switch ties will be spaced in accordance with standard switch plans.

The best ties will be selected for use at rail joints, having faces not less than 8 inches nor more than 10 inches in width.

All ties shall be placed square with the rail and ends lined evenly, parallel with the rail on one side of the track. On double tracks the outside ends of ties will be the line side. All ties shall be placed with heart faces down. Pole ties on curves shall be placed with their butt ends under the inside rail.

79.9 Ballasting, Raising, Tamping and Surfacing.—On all main tracks only selected gravel, crushed stone or slag ballast will be used. On permanent tracks of less importance, ballast shall be of suitable material, and no material shall be brought on the work without previous approval of the Engineer. Ballast will not be distributed until all tie plates are properly placed on ties, and all track full spiked and lined. Care will be used in unloading ballast to avoid wasting it down embankments, slopes or otherwise.

Track will be accurately surfaced to top of rail grade, which will be established by the Engineer whenever required, at even 50 foot intervals on curves, with proper superelevation, and at 100 foot intervals on tangents. Cross ties in new tracks will be thoroughly tamped for their full lengths, care being used to tamp more solidly under and outside the rail than in the center of track, to avoid possibility of center bound ties. Switch ties shall be thoroughly tamped for their full

length, particular care being used with head blocks, and ties under switch points and frogs.

79.10 Superelevation.—The superelevation of the outer rail on curves will be made in accordance with the table which will be furnished or as instructed by the Engineer. The superelevation on main tracks shall not exceed 6 inches, unless otherwise ordered. Superelevation shall be decreased uniformly from point of circular curve throughout the length of spiral curve to point of tangent.

79.11 Switches.—Spring rail or rigid frogs will be used as stipulated in the Agreement or as shown on the Drawings. Switches will be installed in accordance with standard plans, as shown on the Drawings, no variation therefrom being permitted except by written authority. Switch stands will be placed on the side of track shown on the Drawings or designated by the Engineer. The ends of 8 foot switch ties, at the turnout end of switch, will be lined with the ends of cross ties in the track from which the turnout is made. When the switch is set for either straight track or turnout, the contact between switch point and either stock rail or trunk rail shall be so close that a sheet of paper placed between the end of point and head of rail cannot be pulled out. The bend in the stock rail shall be the shortest possible, and must never extend farther than to the theoretical end of the switch point. The stock rail shall be perfectly straight from extreme end of switch point to heel of switch. The turnout rails shall be correctly curved and laid on a uniform curve from heel of switch to toe of frog.

All switch ties shall be well tamped for their full length. The ties under the switch point shall be tamped to perfect surface, in order to afford an even contact between points and slide plates. Especial care shall be taken to secure perfect gage at all frog points. Guard rails shall be spiked to every tie supporting them, and nuts of guard rail bolts shall be thoroughly tightened. Switch ties under frogs shall be so spaced that each frog point will be supported on a tie, and the ties shall be thoroughly tamped to secure perfect surface for their entire length.

79.12 Payment.—Payment under this item shall be made on the basis of the units given below. The unit prices paid shall include the entire cost of all the operations required in the particular work involved, as described in Section 79.1 of this item.

The unit price paid for laying and surfacing track shall be the price per mile of track laid and surfaced, the length of track so paid for to be the total length exclusive of turnouts and crossings. Deductions for turnouts and crossings shall be as follows: For turnouts, the distance from point of switch to heel of frog; for crossings, the distance between heels of frogs in the track involved.

The unit price paid for installing and surfacing turnouts and crossings shall be the price per turnout or crossing, and such unit price shall include the cost of installing all track material, fixtures and appurtenances forming part of the turnout or crossing construction, as shown on the Drawings.

The unit price paid for furnishing, distributing and applying ballast shall be the price per cubic yard of ballast and such unit price shall include the entire cost of switching and spotting the cars and of unloading the ballast and placing it in the track as directed.

The unit price paid for installing tie plates, rail braces and rail anchors shall be the price per tie plate, rail brace or rail anchor. No separate payment shall be made for installing such fixtures where shown on the Drawings as part of the construction of a turnout or crossing; and no payment shall be made under this item for installing such fixtures in connection with Alteration of Tracks, payment for which is provided under Item 77.

When completed, all track shall be in perfect condition for operation; ballast slopes shall be trimmed to correct line; and road bed shall be cleaned up in a neat and orderly manner. The times of acceptance, and the sections in which completed track will be accepted, shall be as stipulated in the Agreement.

Item 80

Ballast

80.1 Description.—Unless otherwise agreed, ballast will be purchased by the District and furnished to the Contractor in ballast cars.

80.2 Payment.—The unit price paid for ballast purchased shall be the price per cubic yard delivered f.o.b. ballast cars at the point of delivery designated in the Agreement covering such purchase.

Item 81

Ties

81.1 Description.—Cross ties furnished may be of three types: sawed ties, with faces and sides sawed; hewed ties, with faces and sides hewed; and pole ties, made from trees of such size that only one tie can be made from a section of the trunk by hewing or sawing two parallel faces, leaving rounded natural sides tapering to a narrower end. The ties may be of white pine, red spruce, or other approved wood. Ties obtained from track removals may be used in tracks of lesser importance, as directed. Sawed ties shall be 7 inches by 8 inches by 8 feet in length. No dimension shall be less than specified.

Hewed faces of hewed ties shall have a width of not less than 8 inches, with even thickness of not more than, nor less than, 7 inches. Pole ties shall be of such size that, were the small end squared, it would be of the dimensions of a sawed tie seven by eight inches, with uniform thickness of 7 inches. All cross ties shall be sawed square at the ends, in the specified length of 8 feet.

Switch ties may be made of white pine, red spruce, or other approved wood. Switch ties shall be 7 inches by 9 inches; head blocks 9 inches by 12 inches; all being sawed, and of the lengths and numbers specified on the Drawings of the standard switch tie layouts.

81.2 Quality.—All cross ties and switch ties shall be made from live, straight timber, free from cracks, wind shakes and rotten knots. Hewed ties and pole ties shall be hewed smooth and out of wind, with opposite faces parallel and straight. Bark shall be removed from all hewed ties and pole ties.

81.3 Piling.—Cross ties of each of the three types described, and switch ties, will be piled separately. Oak ties, if used, shall be piled in open piles having alternate courses of two and eight ties. All others may be piled in solid courses. Switch ties may be piled in any suitable manner permitting ready inspection.

81.4 Inspection and Counting.—All ties are subject to inspection and count by an authorized inspector of the District, whose action in counting and receiving or rejecting the ties offered shall be final. The owner's name and the number of ties shall be plainly marked on every pile, all ties being piled at the owner's risk until inspected. The point of inspection shall be the point of delivery designated in the Agreement, unless otherwise stipulated.

81.5 Payment.—The unit price paid for cross ties shall be the price per tie, f.o.b. cars at the point of delivery designated in the Agreement.

The unit price paid for switch ties shall be the price per 1000 feet B. M. f.o.b. cars at the point of delivery designated in the Agreement.

Item 82

Rail

82.1 Description.—Rails purchased shall conform in all particulars to the specifications of the Railroad Company owning, or to own, the track or tracks in which the rail is to be placed.

82.2 Payment.—The unit price paid under this item shall be the price per gross ton of rail f.o.b. cars at the point of delivery designated in the Agreement.

Item 83**Other Track Material**

83.1 Description.—Under this item shall be included material of every nature included under Account No. 10—Other Track Material, as given in Classification of Investment in Road and Equipment of Steam Roads, issued by the Interstate Commerce Commission. All material under this item shall be manufactured and installed in accordance with the standards and specifications of the Railroad Company owning, or to own, the track or tracks in which such material is placed. All material shall be subject to inspection by an authorized inspector of the District, and inspection shall be made at such times and places as are designated in the Agreement.

83.2 Payment.—Payment for material purchased under this item shall be made at the unit prices stipulated in the Agreement and shall include the entire cost of manufacture and delivery, in good condition, at the point designated in the Agreement.

Item 84**Railroad Crossings and Signs**

84.1 Description.—Where indicated on the Drawings or required by the Engineer, the Contractor shall install plank crossings on tracks, at private or public roads, streets and highways, of such construction as is shown on the Drawings. The Contractor shall set, at the proper locations along or near tracks, marked by the Engineer, all mile posts and such other posts and signs as are required by law, or are ordered by the Engineer. Posts and signs will be furnished by the District as required, but materials for crossings shall be furnished by the Contractor as specified in Item 50—Timber and Lumber, Untreated.

84.2 Payment.—Payment under this item shall cover the entire cost of furnishing timber and hardware for crossings, of transporting posts and signs from designated storage yards to the site of the work, and of installing such crossings, posts and signs as directed.

The unit price paid for installing posts and signs shall be the price each for such posts and signs.

The unit price paid for crossings shall be the price per thousand feet board measure of timber or lumber placed in the crossings as directed, including the cost of all nails, boat spikes and other hardware entering into the construction of the crossings.

Item 85**Track Material—Storage**

85.1 Description.—Track material which is not intended for immediate use shall be piled or stored at designated storage yards. The different classes of material shall be separated and separately piled by the Contractor under the direction of the Engineer.

85.2 Payment.—Payment under this item shall include the cost of unloading, transporting, separating and piling or storing the material at designated storage yards. Unless otherwise agreed, the unit prices paid under this item shall be as follows:

For Rail, Rail Fastenings, and other track fixtures—Price per gross ton.

For Complete Turnouts—Price each.

For Cross Ties—Price each.

For Switch Ties—Price per 1000 feet B. M.

Storage of track material obtained by Removal of Tracks shall not be paid for under this item, but shall be paid for under Item 78, Removal of Tracks.

Item 86**Steel Bridge Superstructure—Fabrication**

86.1 Description.—This item will include the fabrication and delivery of all steel work required for railroad bridges, highway bridges and viaducts. The Contractor will be furnished by the Engineer with stress sheets of the several spans required, together with typical details which will indicate the amount and disposition of metal required in their fabrication. These details will show the requirements as to shop and field riveting and from them the Contractor can prepare his shop drawings, which must receive the approval of the Engineer before mill orders are placed and shop fabrication begun. Blue prints of shop drawings shall be furnished the Engineer in whatever quantities he may require for record and erection purposes.

86.2 Material.—Structural steel, rivet steel, and cast iron shall conform in physical properties and manufacture to the General Specifications for Steel Railway Bridges as adopted by the American Railway Engineering Association, 1920, Appendix A.

86.3 Workmanship.—Shop practice on Railroad Bridges shall conform to the General Specifications for Steel Railway Bridges, as adopted by the American Railway Engineering Association, 1920, Appendix A, with the stipulation that "reamed work" shall be required.

Workmanship on other than railroad bridges must be first-class in every respect and equal to the best practice in modern bridge works. Lack of facilities will be considered no excuse for furnishing poor or inferior work.

All material shall be thoroughly straightened in the shop by proper appliances, before being laid off or worked in any way.

All shearing of plates and angles shall be neatly done. All gusset plates shall be cut so as to leave no projecting corners. All edges and ends of parts in built members shall be cut true to line and flush with each other, or be dressed after assembling. No sharp, unfilleted, re-entrant angles will be allowed anywhere, and wherever plate, angle or shape has been cut into, the fillet as well as the cut must be finished with a sharp cutting tool, or with chisel and file, so that no sign of the punched or sheared edge remains.

Riveted members shall have all parts well pinned up and drawn together with bolts before riveting is commenced. All stiffeners shall fit neatly between upper and lower flanges of girders. Special care shall be taken to get a tight fit at the upper ends of all stiffeners in deck girders and the lower ends of stiffeners over end bearings in all girders. All fillers under stiffeners and all splice plates shall be cut straight and square at the ends, and shall not fall back more than one-eighth of an inch from flange angles. All holes or pockets where water might collect must be avoided. All flat lattice bars with single rivets shall have neatly rounded ends concentric with the rivet hole, and their ends must not project beyond the flange to which they are attached.

All finished members, built or rolled, shall be made straight and free from bends, twists or open joints, and if necessary must be cut apart, straightened and reriveted. Particular care shall be taken to have all members straight before pin holes are bored or ends are milled. In all members, except the top flanges of girders, the abutting joints shall be milled true to a perfect bearing unless they are fully spliced. In flanges of girders, the joints shall be cut or dressed true and straight and fitted close together, especially where open to view.

All chord and spliced members that are faced for contact bearing shall be put together in the shop, and after being drawn up into contact at the joints and lined up perfectly with the splice plates in place, must have the field rivet holes reamed to a fit before being taken apart. The assembled parts with their splice plates shall be match-marked, so that they may be reassembled correctly in the final erection. All holes for shop rivets shall be punched $1/16$ -inch greater in diameter than the nominal size of the rivet. All holes for field rivets may be punched in like manner, with the following exception: In case of through trusses, where $7/8$ -inch rivets are called for on the plans, the field holes for the same shall be punched $13/16$ -inch di-

ameter and reamed to $15/16$ -inch diameter. This reaming shall be done while the connective parts are temporarily bolted together, whenever practicable, and when impracticable, such reaming shall be done to a hardened steel template not less than $3/4$ -inch thick.

Pins and rollers, after being turned perfectly straight and smooth, shall be entirely free from flaws. Their finished diameters must be that shown on the Drawings.

Steel which has been partially heated, shall be thoroughly annealed, including the off-set connection angles of floor beams to the main trusses, but excluding all off-set stiffener angles and fillers on main girders.

The ends of columns or compression members bearing on each other or on bearing plates, shall be milled, to insure a perfect bearing contact.

All floor beams and roadway stringers (inserted between floor beams), shall be finished accurately to the lengths shown in the Drawings, and the outstanding legs of the end connection angles must be in true and parallel planes. Unless special forms are used to hold the end connection angles in correct position during the assembling and riveting, both ends of floor beams and roadway stringers (as above mentioned) shall be milled to obtain the desired result. The burrs on all reamed holes shall be removed by a tool, countersinking about $1/16$ -inch under rivet heads.

For all unreamed work the diameter of the punch shall be not more than $1/16$ -inch greater, nor the diameter of the die more than $1/8$ -inch greater, than the diameter of the rivet. All punched holes shall be so accurately spaced that when the parts of any member are assembled all of the rivets may be easily inserted. Any corrections necessary shall be made with reamers. No drifting to enlarge unfair holes will be allowed.

Rivets shall be machine driven where possible, and for rivets with more than 1-inch grip, a machine capable of exerting a direct pressure upon the rivet, irrespective of the thickness of the pieces being riveted, will be preferred. All rivets must look neat and finished, with heads full, and of equal size, central on shank, and grip the assembled pieces firmly. No recupping or caulking will be allowed. All loose or slovenly looking rivets shall be cut out and replaced, and such rivets shall be identified by a cut or chisel mark by the inspector's hammer. Rivet heads showing an even burr all around the heads will be preferred to a scant head cut down close to the metal under head. In cutting out rivets, great care must be taken not to injure the adjacent metal. If necessary, they must be drilled out. When angles are used for lateral or sway bracing, the distance between rivet holes, at opposite ends, shall be made enough shorter than the figured length to insure that the member will be drawn up tight when erected in place.

All pins, nuts, bolts, rivets and other small details shall be boxed crated, so that they can be easily handled in unloading, and to insure against loss or damage. The approximate or the scale weight of every piece, and of the contents of every box, shall be marked on it in plain white figures.

86.4 Weighing and Shipping.—The requirements for weighing and shipping superstructure steel shall conform to the General Specifications for Steel Railway Bridges, as adopted by the American Railway Engineering Association, 1920, Appendix A.

86.5 Shop Painting.—After fabrication and before shipment, all material shall be thoroughly cleaned from all dirt, rust, grease and loose scale, and shall be given one shop coat of red lead paint, well worked into all joints and open spaces, in accordance with Section 28, Metal Work—Painting with Red Lead.

86.6 Mill and Shop Inspection.—Mill and shop inspection shall be handled in accordance with the General Specifications for Steel Railway Bridges, as adopted by the American Railway Engineering Association, 1920, Appendix A.

86.7 Payment.—Payments under this item shall be made at the unit price stipulated in the Agreement for the number of pounds of steel which fulfills the requirements of these specifications and is ordered and delivered in accordance with the terms of the Agreement. The unit price shall cover deliveries f.o.b. cars at the point designated in the Agreement and shall include all freight charges required in such delivery.

The Contractor will be charged, and there shall be deducted from the payment in final estimate, the cost to the District of the correction of shop and drawing room errors that may develop in the erection of the fabricated material. The extent and need of such correction shall be determined by the Engineer.

Item 87

Steel Bridge Superstructure—Erection

87.1 Description.—Structural steel will be furnished by the District and delivered to the Contractor on cars at the side track nearest the work, or as stipulated in the Agreement. The Contractor shall, at his own expense, furnish all labor, falsework, derricks, travelers, tools, snatching-up bolts, drift pins, equipment and other items necessary to load, store and erect the steel superstructure under these Specifications. He shall furnish all necessary watchmen and all proper safeguards for the conduct of the work.

The Contractor shall receive on board cars, as described, the new metal work of the structure and shall unload it immediately upon delivery by the District, assuming demurrage charges that may accrue after delivery as described. He shall make arrangements, at his own expense, for switching and work trains that may be required, and carefully unload all material in such a way that it will not be injured, and shall stand all girders upright. All material shall be piled upon blocking to keep it above ground. The Contractor shall be held responsible for loss or damage to steel work after it is delivered, as described, and shall secure it against depredation.

87.2 Method of Erection and Design of Falsework.—The method of erection and the design of falsework and erection equipment shall be subject to the approval of the Engineer. Such approval shall not relieve the Contractor from any responsibility for its strength or adequacy for the work.

87.3 Conduct of Work.—All material shall be handled without damage. Nuts on pins and on bolts remaining in the structure shall be securely locked by checking the threads. All rivets shall be uniformly and thoroughly heated, and none shall be driven that are burnt. Rivets shall be driven with pneumatic hammers, where possible, and shall be tight. Recupping or calking will not be permitted. All heads shall be full and uniform in size, free from fins, concentric and in full contact with the metal. All heads shall be painted immediately after acceptance. All defective rivets shall be cut out and replaced, and the surrounding metal shall not be injured in this work. If necessary, to avoid such injury, the rivets shall be drilled out.

The Contractor shall drill the holes for all anchor bolts, except those built in the masonry, after the steel work is in place, and shall set the bolts in Portland cement grout. All bed plates resting on masonry shall be accurately blocked in position, and shall be brought to full even bearing by means of a thin Portland cement mortar poured, under the direction of the Engineer.

All splices and field connections shall, by the use of fitting-up bolts and drift pins, be securely fastened together before riveting. In the trusses, not less than one-third of the field holes shall be so filled. All tension splices shall be riveted complete before the bridge is swung. Splices in compression shall not be riveted until the members have been subjected to dead load stresses after the blocking is removed and the trusses are free from falsework.

87.4 Camber.—The trusses shall have the camber indicated in the blocking diagram, shown in the erection diagram on the Drawings. Blocks of suitable form and size shall be used for this purpose, and shall be carefully maintained in correct elevation until the span is swung.

87.5 Correction of Misfits.—The Contractor will be required to correct any ordinary misfits without extra charge. The phrase “ordinary misfits” means: slight variations in location of field holes, requiring drifting and some reaming; tight fits or slight overrun of material, requiring a little chipping; coping of isolated beams; drilling a few blind holes; and the occasional rehandling of members on account of errors in assembling marks.

Misfits and shop errors of any considerable magnitude shall be immediately reported to the Engineer, for his inspection prior to their correction, and the Contractor shall keep an itemized account of the cost of such corrections, presenting to the Engineer for his approval a certified copy of the same, together with bill therefor, and a clear description of the work done, including in the same: (1) piece marks of members concerned; (2) numbers of drawings which may be referred to in studying said description; and (3) a statement comparing fabrication of the detail at fault with the shop or erection Drawings. The statement shall indicate the character and amount of the error, and whether it originated in drawings or fabrication. It is intended to be used by the Engineer as the basis for a charge against the fabricator on account of misfits and shop errors. The bill rendered for corrections shall not include profit, nor shall its amount be in excess of what the Engineer shall consider reasonable under the circumstances.

87.6 Cleaning and Painting.—After the steel work has been erected the entire surface shall receive two coats of graphite or carbon paint of a brand to be approved by the Engineer, enough time being allowed for the first coat to become dry before the second is applied. All surfaces inaccessible after erection shall receive two coats of paint before being assembled. The paint shall be used without thinning or mixing, except by permission of the Engineer. The surfaces shall be thoroughly cleaned, and wherever the shop coat has been broken or removed all loose scale and rust shall be removed to a bright surface with wire brushes before painting. No paint shall be applied in wet or freezing weather or when the surface of the steel is damp. The paint shall be well brushed out and all painting shall be done strictly in accordance with the requirements for first-class work. The coats of paint shall be of different colors, as directed by the Engineer.

87.7 Payment.—Payment for the erection will be made at the unit price or lump sum stipulated in the Agreement on the basis of the actual weight of steel structure in pounds, or as a lump sum covering the cost of erection and all expense incidental thereto. The unit price or lump sum paid under this item shall be considered full payment for unloading, storing, transporting, erecting, cleaning and painting of the structural steel, bolts, rivets and other metal forming the permanent structure, all other work and handling subsequent to the deliv-

ery of the material to the Contractor, as specified in Section 87.1 of this item, and falsework and other temporary construction and operations necessary and incidental to the erection of the permanent structure.

Item 88

Reerecting Steel Bridges

88.1 Description.—Wherever so shown on the Drawings, existing steel bridges shall be taken down and transported to the points designated, and reerected, as indicated on the Drawings, and as described herein. The work to be done under this item shall include all labor, equipment, tools, falsework, staging, metal work, repairs to superstructure, and all other materials, labor and incidentals necessary to complete the work contemplated; but it shall not include any materials or labor required for constructing or reconstructing the substructure or approaches, or for constructing floor or pavements, which are included under other items.

88.2 Conduct of Work. Prior to their removal, the members which compose the existing bridges shall be marked and match marked by the Contractor in accordance with the marking diagram of each bridge to be furnished by the Engineer. The spans shall then be dismantled, care being taken that the material shall not be injured or the field holes distorted. Heads of field rivets to be removed may be burned off, provided that in so doing the Contractor does not injure the metal of the member itself. Minor materials injured or destroyed during the operation of dismantling shall be replaced by the Contractor with new material at his own expense.

After dismantling the Contractor shall do such remodeling, strengthening and supplying of new connections, tie bars, pin bars and lattice bars and other details and material as shall be shown on the Contract drawings, or listed in the Agreement. He shall also thoroughly clean and paint with one coat of red lead paint, all parts which will be inaccessible after erection, as specified in Section 0.128, Painting with Red Lead.

The members of the old bridges so remodeled shall be transported on trucks or railway cars by the Contractor to the several bridge sites at which they are to be respectively erected.

This old material shall then be erected in the new structure and painted with the same care and in the manner described under Section 87.6, Superstructure Erection, Cleaning and Painting.

88.3 Payment.—The lump sum stipulated for Item 88, shall be considered full compensation for all services, labor, materials and in-

cidentalals required to take down, transport, remodel, and reerect existing steel and iron bridges, as described herein and as indicated on the Drawings, but no payment will be made in progress estimates for the taking down, remodeling, transporting and reerecting of any bridge until the work on such bridge shall have been completed.

Item 89

Guardrails

89.1 Description.—Where indicated on the Drawings or ordered by the Engineer, the Contractor shall furnish and erect guardrails of the types shown on the Drawings.

89.2 Materials.—Wooden posts shall be of sound, seasoned red cedar, white pine or other satisfactory wood, entirely stripped of bark or skin, not less than 6½ feet long, straight, and not less than 6 inches in diameter at any section.

Lumber used in the construction of guardrails shall be of seasoned Oregon fir, or other satisfactory wood, surfaced on 4 sides, of a grade equal to that specified under Item 50, Timber and Lumber, Untreated, and of a length equal to twice the distance between adjoining posts, approximately 16 feet.

89.3 Erection.—Post holes shall be excavated sufficiently large to properly admit the post and leave room for setting. Refilling shall be of proper material and thoroughly tamped. Posts shall be set plumb, not more than 8 feet apart between centers, and set not less than 3 feet into the ground, with the sides toward the highway on a true line or as directed. The lower part of each post, to a point about 3 feet from the top shall be charred as directed.

89.4 Painting.—When the lumber is dry and weather conditions are suitable, the guardrails shall be painted as follows: Before being assembled notches in the posts, the tops of the posts, and all parts of rails that will be inaccessible after erection shall be painted with two coats, and after erection the rails and posts shall be given three coats of best white lead and linseed oil.

89.5 Payment.—The quantity of guard-rail to be paid for under this item shall be the number of linear feet actually built in accordance with the Drawings and directions, as measured along the structure. The unit price stipulated under this item shall include the cost of furnishing and erecting all posts, woven wire and rails, of excavating and refilling post holes, the cost of painting, charring, bolts, spikes, nails and staples, and all expense incidental to completing the work in a satisfactory manner.

Item 90**Brush Mats and Cribbing**

90.1 Description.—This item shall include willows, brush, and trees cut and used for mats and cribbing in structures for river bank protection, silt control and other purposes. It shall be cut and used as directed, or as shown on the Drawings.

90.2 Payment.—Payment under this item shall include the labor and materials for cutting, transporting, and placing of willows, brush and tree tops and will be made on a force account basis according to the actual field cost of the work done, all in accordance with the provisions of Section 0.19, Extra Work.

Item 91**Permanent Buildings**

91.1 Description.—Under this item shall be included buildings needed by the District for operators' quarters, warehouses or storehouses for material and equipment, and other purposes of a permanent nature. Buildings for construction purposes are not included, the cost of such being part of the items of construction being served.

91.2 Payment.—Payment under this item shall be made as a lump sum for each structure built to the satisfaction of the Engineer according to the plans and specifications therefor.

Item 92**Priming and Puddling**

92.1 Description.—This item shall include all expense chargeable to the placing of the irrigation system in operating condition after the completion of construction.

Item 93**Extra Work**

93.1 Description.—This item shall include all Extra Work performed in connection with the Contract, as provided for in Section 0.19 of the Specifications, entitled Extra Work.

93.2 Payment.—Payment for Extra Work, when done under a written "Order for Extra Work" from the Engineer, will be made at

the actual necessary cost plus 15 per cent, as prescribed in Section 0.19 of the Specifications, entitled Extra Work.

Item 94

Cleaning Up

94.1 Work to Be Done.—Before the completion of the work included in the Contract, the Contractor shall completely remove and satisfactorily dispose of all temporary works, to the extent directed. He shall tear down and dispose of all temporary buildings, trestles or stagings constructed by him; shall remove or grade, to the extent directed, all embankments or cofferdams made for construction purposes; shall satisfactorily fill excavations as directed; shall remove all plant and equipment; shall remove the rails and ties and other woodwork of any temporary or construction railway built by him; shall satisfactorily dispose of all rubbish resulting from the operations under the Contract, and shall do all work necessary to restore the territory embraced within the zone of his operations to a condition at least as sightly as at the beginning of work under this Contract.

94.2 Payment.—For all labor, materials and miscellaneous work required to leave the grounds in an acceptable condition, the Contractor shall receive the lump sum stipulated for this item, which shall be included for payment in the final estimate.

Item 95

Maintenance of Irrigation and Traffic

95.1 Description.—Under this item shall be included all expense incidental to the maintaining of railroad, highway and other traffic during construction, and also for maintaining uninterrupted irrigation service by the present ditch system, during the period of construction of the new system.

Item 96

Purchase of Right-of-Way

96.1 Description.—This item shall include all damages, easements, and purchase of right-of-way for structures and works of the District.

Item 97**Purchase of Water Rights**

97.1 Description.—This item shall include all amounts paid for water rights and expenses incidental to such purchase.

Item 98**Operation During Construction**

98.1 Description.—This item shall include all expense of operation during construction and during an initial period after completion pending the date of turning works over to the operating departments.

Item 99**Field Engineering**

99.1 Description.—This item shall include all expense of the engineering department applied to field location and construction, including field inspection and field accounting.

Note.—For accounting purposes of the District, entries of charges to Extra Work shall be classified and made, wherever possible, under appropriate items of the Detail Specifications.

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